

# **TOSHIBA**

FILE NO. 116-9705

## **TECHNICAL TRAINING MANUAL NEW V MECHANICAL DECK**

### **VIDEO CASSETTE RECORDER**

***V-227G, V-247F  
V-427G, V-447F  
V-427W, V-E15  
V-E25H, V-E35  
V-W15, V-X225  
V-X445***

# CONTENTS

<b>1. BASIS OF MECHANISM .....</b>	<b>1-1</b>	<b>2-6. Main Parts Replacement .....</b>	<b>2-9</b>
1-1. Features of Mechanism .....	1-1	2-6-1. Top Bracket Replacement .....	2-9
1-2. Basic Configuration of Mechanism ...	1-1	2-6-2. Door Open Lever Replacement .....	2-9
1-3. Main Mechanisms and Functions .....	1-2	2-6-3. FL Cassette Guide Assembly Replacement .....	2-10
1-3-1. Tape Path System .....	1-2	2-6-4. Cassette Holder Assembly Replacement .....	2-10
1-3-2. Reel Drive System .....	1-3	2-6-5. FL Arm Lever Replacement .....	2-11
1-4. Basis of the Mechanism .....	1-4	2-6-6. FL Drive Slider, Joint Gear 2, FL Cam Gear, and Joint Gear 1 Replacement .....	2-11
1-4-1. Front Loading .....	1-4	2-6-7. Worm Gear, Worm Gear Holder, Loading Motor, and Worm Wheel Replacement .....	2-13
1-4-2. Slot in/Slot out Modes .....	1-5	2-6-8. Loading Drive Gear, Cam Slider, S,T Loading Lever Assembly, Pinch Drive Lever, and Tension Drive Lever Replacement .....	2-14
1-4-3. Tape Loading .....	1-6	2-6-9. Tension Lever, Band Brake, and Tension Sleeve Replacement .....	2-16
1-4-4. Playback Standby Mode .....	1-7	2-6-10. Clutch Gear Assembly, Idle Lever Assembly, and Up/Down Lever Replacement .....	2-17
1-4-5. FF/REW Modes .....	1-7	2-6-11. S, T Brake Assembly Replacement .....	2-17
1-4-6. Record/Playback Modes .....	1-8	2-6-12. S, T Reel Table Replacement .....	2-18
1-5. System Control .....	1-9	2-6-13. S, T Slider Assembly Replacement .....	2-18
1-6. System Control and Mechanical Operations .....	1-10	2-6-14. Pinch Assembly, No. 9 Guide Lever, and Cassette Door Guide Replacement .....	2-19
1-6-1. Mechanical Operation .....	1-10	2-6-15. FE Head Replacement .....	2-20
1-6-2. Mode Sensor Drive .....	1-13	2-6-16. ACE Head Assembly Replacement .....	2-20
1-6-3. Operations in Each Mode .....	1-14	2-6-17. Head Cleaner Assembly and Head Cleaner Sleeve Replacement .....	2-21
1-7. Self-Check Function .....	1-44	2-6-18. Ground Brush Assembly Replacement .....	2-21
1-7-1. Outline .....	1-44	2-6-19. Cylinder Holding Plate Replacement .....	2-22
1-7-2. Storing Abnormal Modes .....	1-44	2-6-20. Head Assembly (Cylinder) Inspection and Replacement .....	2-23
1-7-3. Abnormality Mode Display .....	1-44	2-6-21. Capstan Motor Assembly and Reel Belt Replacement .....	2-24
1-7-4. Cylinder Rotation Time Display .....	1-44	2-6-22. No. 8 Guide Cap Replacement .....	2-25
<b>2. MECHANICAL ADJUSTMENT ....</b>	<b>2-1</b>	<b>2-7. Check and Adjustment .....</b>	<b>2-25</b>
2-1. Mechanical Parts Location .....	2-1	2-7-1. Check of Tension Post Position .....	2-25
2-2. Servicing Jig List .....	2-2	2-7-2. Reel Torque Check .....	2-26
2-3. Main Parts Servicing Time .....	2-3	2-7-3. Tape Transport System Adjustment .....	2-27
2-4. Mechanism Check Method .....	2-4		
2-4-1. External Appearance Check .....	2-4		
2-4-2. Motor and Sensor System Check .....	2-4		
2-4-3. Abnormality Analysis by Self-check Function .....	2-4		
2-4-4. Check by Defective Analyzing Table .....	2-5		
2-4-5. Unloading Method of Cassette in Manual 2-7			
2-4-6. Check Method of Each Operation Mode without Loading the Cassette .....	2-7		
2-5. Mechanical Deck Removing and Mounting Method .....	2-8		
2-5-1. Mechanical Deck Removal .....	2-8		
2-5-2. Mechanical Deck Mounting .....	2-8		

# 1. BASIS OF MECHANISM

## 1-1. Features of Mechanism

The following items describe features of the mechanism in VTR.

1. This VTR uses 3-motor system consisted of a cylinder motor, capstan motor, and loading motor.  
A capstan motor is used to drive the reel, and the driving force is transmitted through the reel belt. The front loading, tape loading, and mode shift operation are performed by the loading motor.
2. The time duration from cassette-in to picture appearance is shortened by employing the loading drive mechanism (automatic transferring operation from the front loading to the tape loading by rotating the loading motor continuously), and by increasing the speed of the tape loading, etc.
3. Employment of the full loading system shortens time required to shift the mode such as STOP to PLAY-BACK picture display.
4. To simplify wiring and others, the electrical components relating to operation of the mechanical deck, such as sensors, cam switch, servo microcomputer, etc. are mounted on the PC boards arranged all over the bottom side of the mechanical deck.

## 1-2. Basic Configuration of Mechanism

As shown in Fig. 1-2-1, the mechanism of VTR is configured with five main blocks, and each operation is precisely controlled by the microcomputer built in the system control section.

First, load a video cassette tape in VTR:

1. The cassette is automatically set on the reel table.
2. The tape is pulled out from the cassette, and wrapped around the cylinder.
3. The cylinder turns in a constant speed rate synchronizing with the vertical Sync. signal of video signal.
4. The tape runs in synchronization with cylinder rotation and traces the video tracks precisely.
5. The running tape is taken up by the reel, and the tape feeding side is given with a proper tension so that tape is not slacked.

The above series of operations are performed under control of the system control section. The system control section also sends commands to each mechanism according to the operation buttons, thus the VTR is designed so that various operations such as recording, playback, special playback, cue/review, and FF/rewind, etc. are correctly performed.

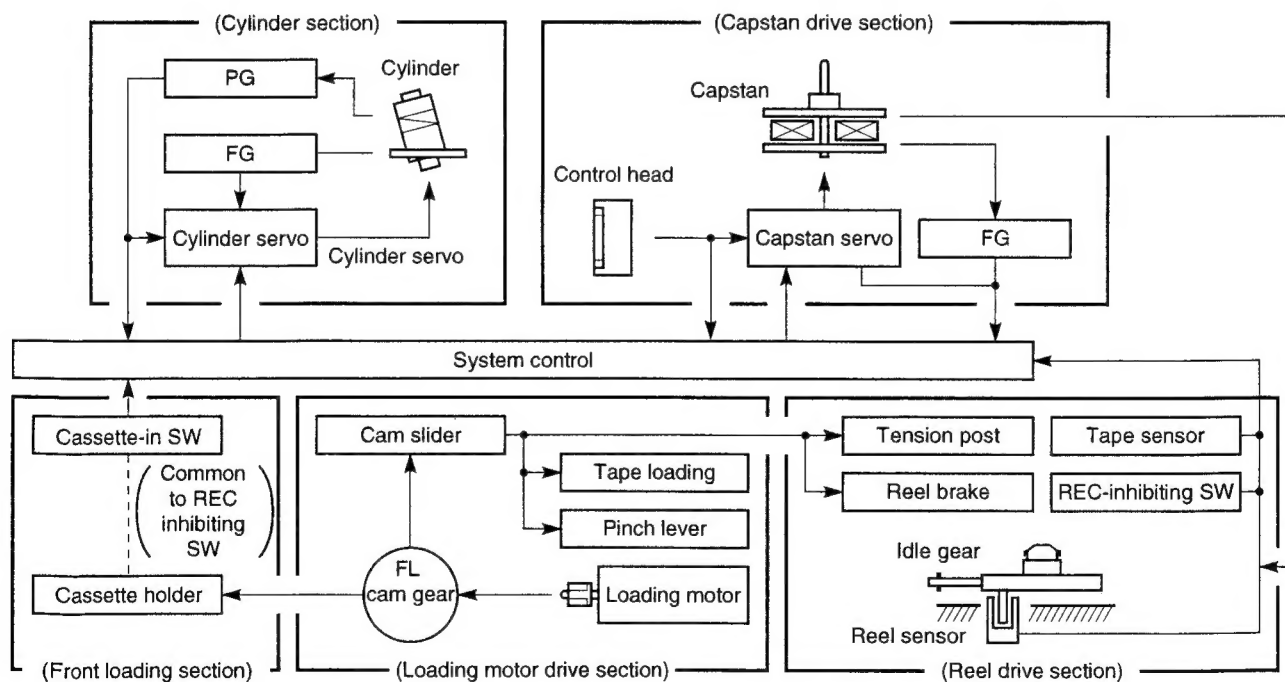


Fig. 1-2-1 Basic configuration of the mechanism

### 1-3. Main Mechanisms and Functions

#### 1-3-1. Tape Path System

The tape come out from the supply reel (S) of the video cassette runs through paths shown in Figs. 1-3-1 and 1-3-2, and is taken up by the take-up (T) reel. (S stands for the supply reel, and T for the take-up reel, hereafter.) At S reel side (tape entrance side of the cylinder) against the cylinder, a tension post to allow the tape surface to contact with each head with a proper tension which assures stable running, an FE head which erases entire data of the tape, and an S guide roller which restricts tape motion in upward/downward direction are provided.

In the same way, a T guide roller, audio head to record audio signals at upper side of the tape, control head to record and reproduce a control signal at lower side of the tape, and an audio erase head to erase only the audio signals and perform after-recording in parallel with the audio head are provided at T reel side (tape exit side of the cylinder).

The guide parts marked with asterisks (\*) are equipped with the adjusting mechanism to stabilize the tape running or to record and reproduce the signals precisely.

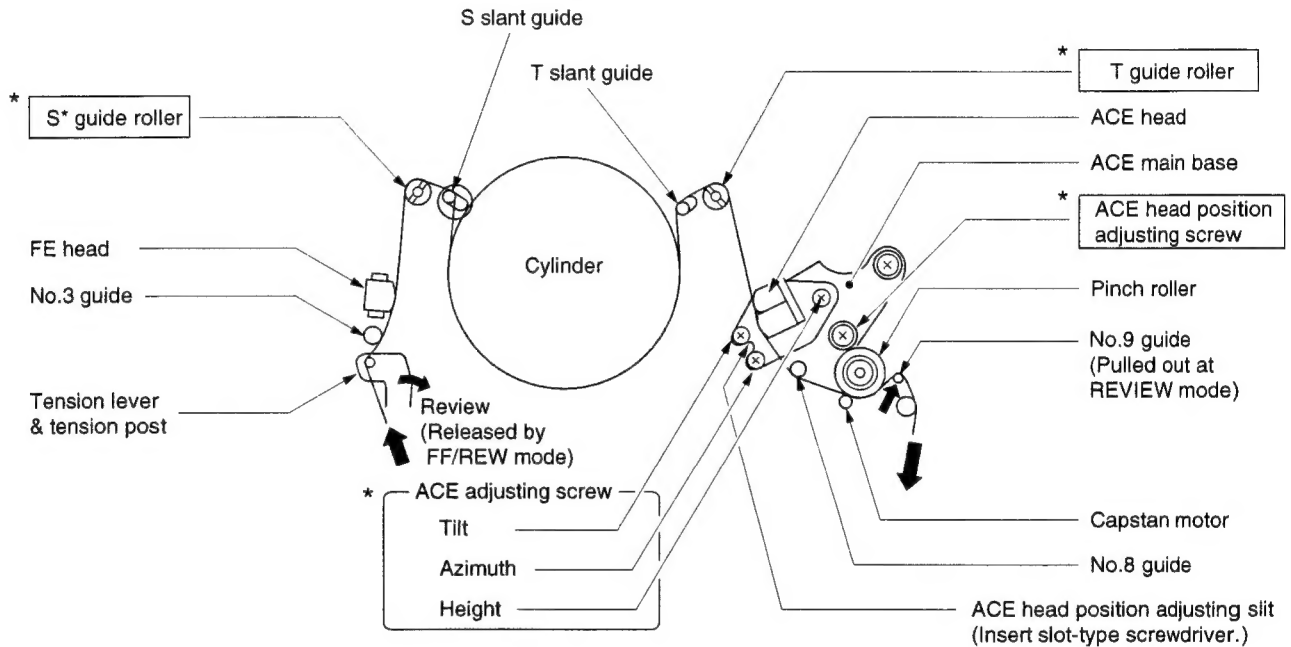


Fig. 1-3-1 Tape path system

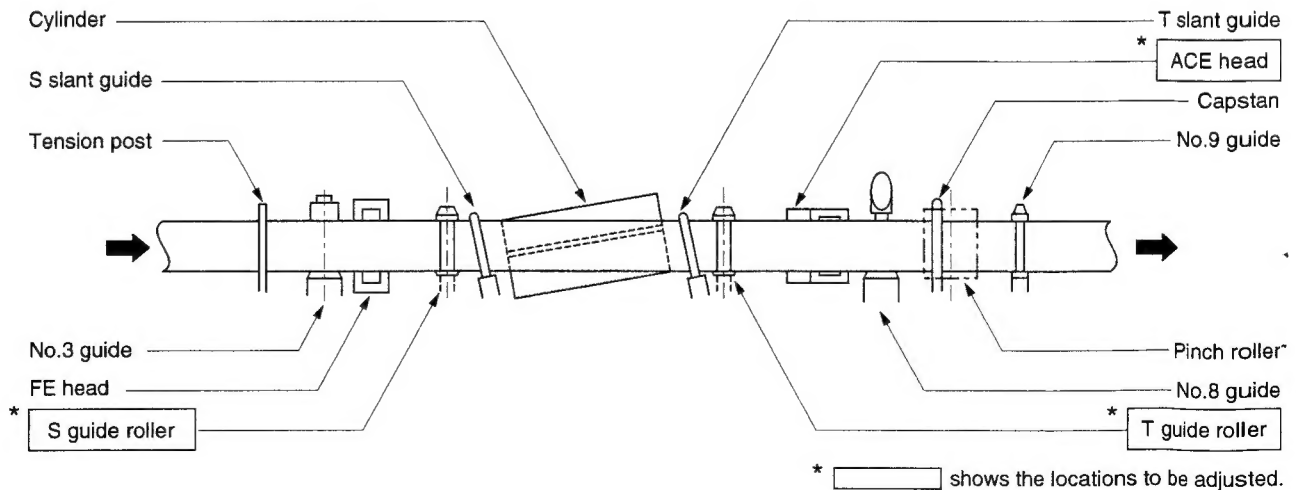


Fig. 1-3-2 Guide path system

### 1-3-2. Reel Drive System

The reel drive system consists of a capstan motor as a drive power source, belt as a power transmission mechanism, clutch mechanism, idle gears, and a reel table. Selecting of forward rotation or reverse rotation is carried out by an idle gear which changes its rotating direction according to rotating direction of the clutch gear. Reel take-up torque is selected according to an operation mode.

In the record, playback, cue, review modes, the reel take-up torque is controlled by the clutch mechanism, thereby the tape fed by the capstan is taken up with a proper torque.

In the FF and REW modes, the clutch enters a direct connecting status in which the clutch mechanism does not operate and the capstan drive torque is transmitted without reduction, so a high speed taking-up is enabled.

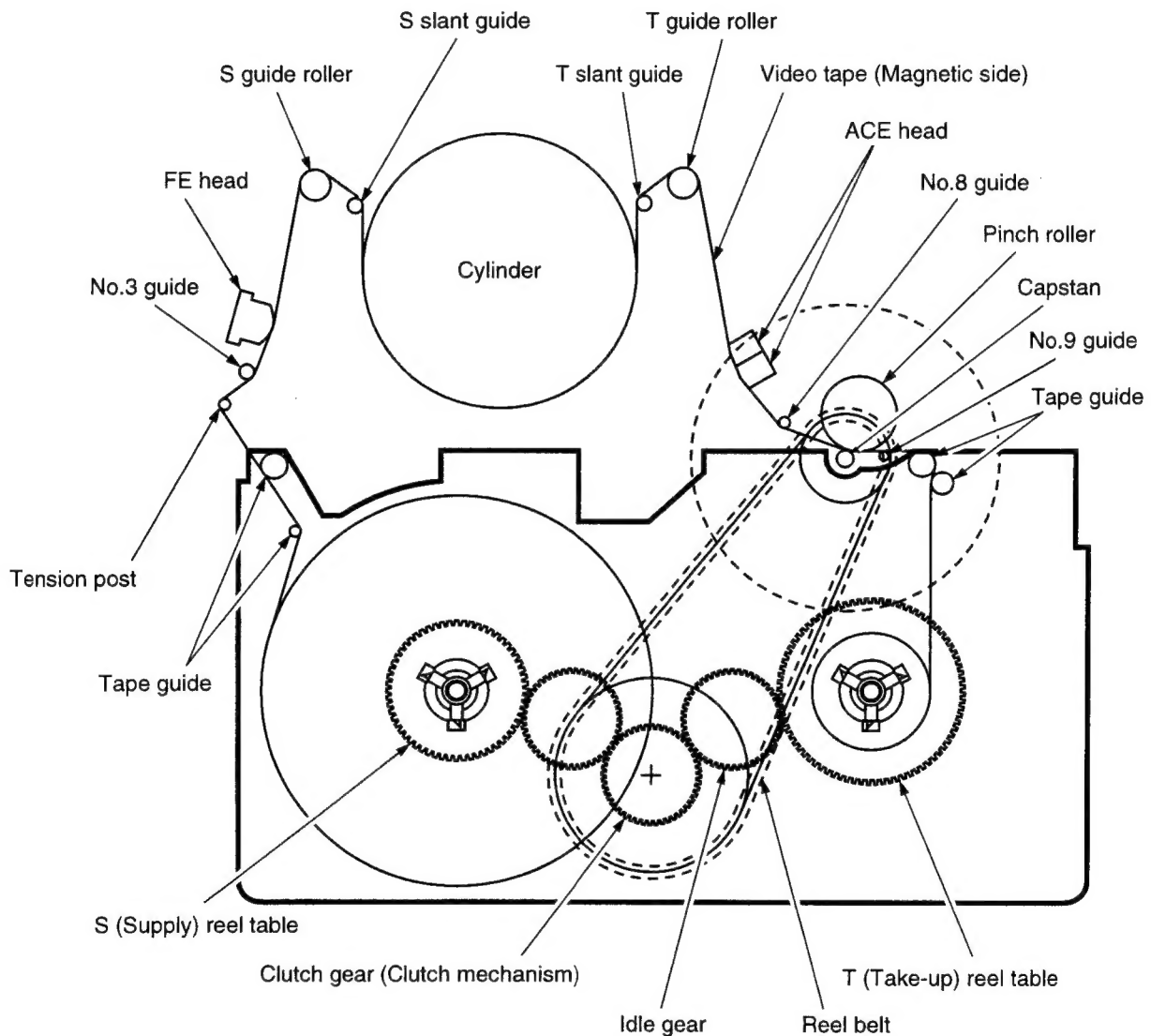


Fig. 1-3-3 Reel drive system

## 1-4. Basis of the Mechanism

### 1-4-1. Front Loading

1. When a video cassette is inserted into the cassette holder and pushed furthermore, FL arm lever is rotated by motion of the cassette holder. Then, the REC-inhibiting lever mounted on the mechanical deck rotates and turns on a switch on the PC board.
2. When the information of switch ON is transmitted to the microcomputer, the loading motor starts to rotate.
3. The rotation is transmitted in a sequence shown below:  
Loading motor → worm gear → worm wheel → FL cam gear → FL drive slider → FL arm lever → cassette holder.
4. The video cassette is horizontally moved.
5. The cassette tape is vertically moved. In this case, the cassette lid is opened.
6. The cassette tape is set on the reel table, and loading operation completes.
7. The cassette tape is loaded.
8. The status becomes full loading.
9. When the cassette is out, the reverse steps of the above procedure are carried out.

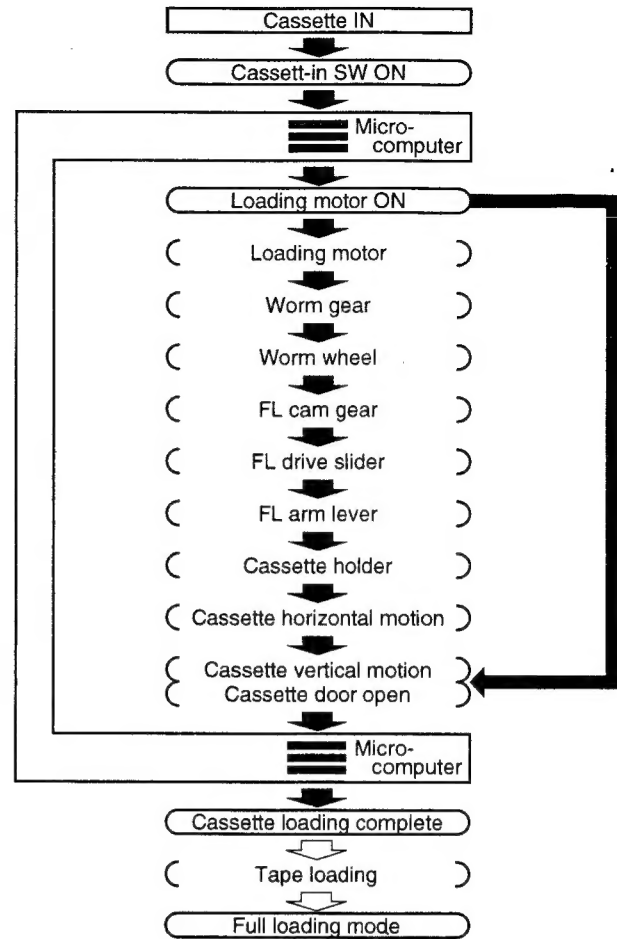


Fig. 1-4-1

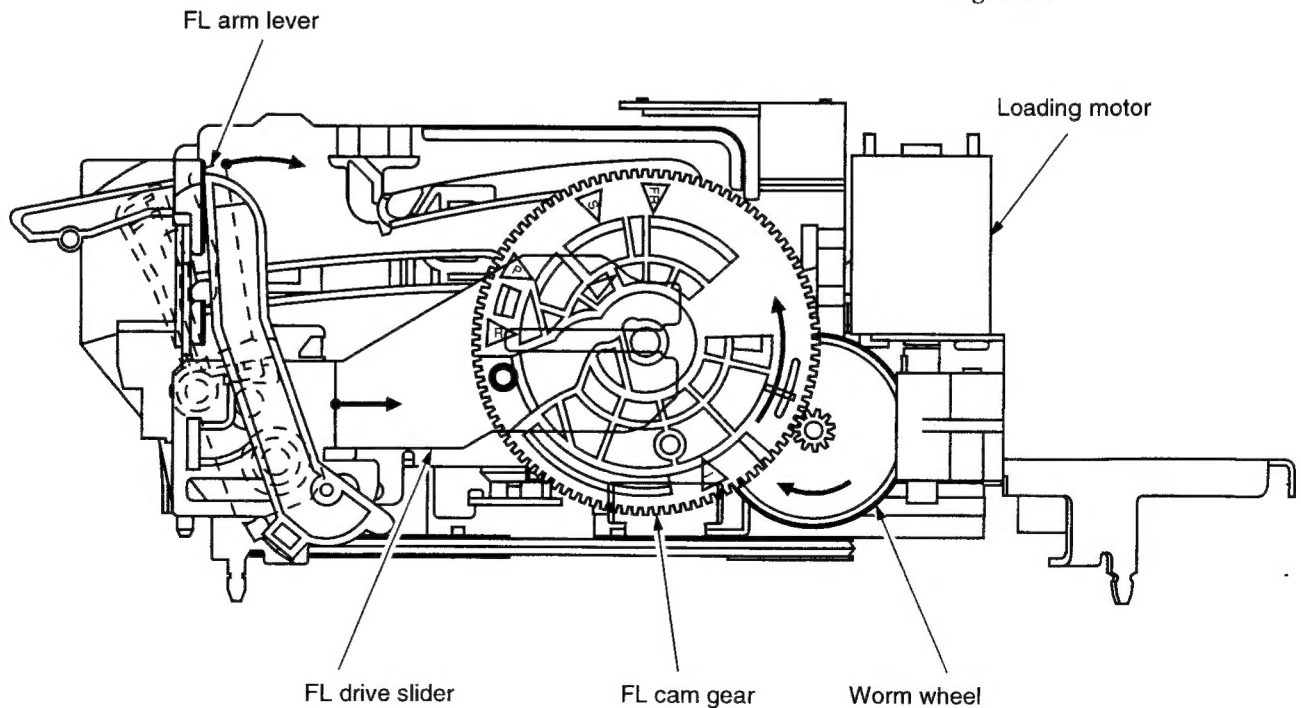


Fig. 1-4-2 Drive transmission path

#### 1-4-2. Slot in/Slot out Modes

When a cassette is entered in the VTR, the cassette is set on the reel table by the front loading mechanism.

In this case, the tension post, loading tape guide, capstan motor, and the No. 9 guide are positioned inside of the tape in the cassette case.

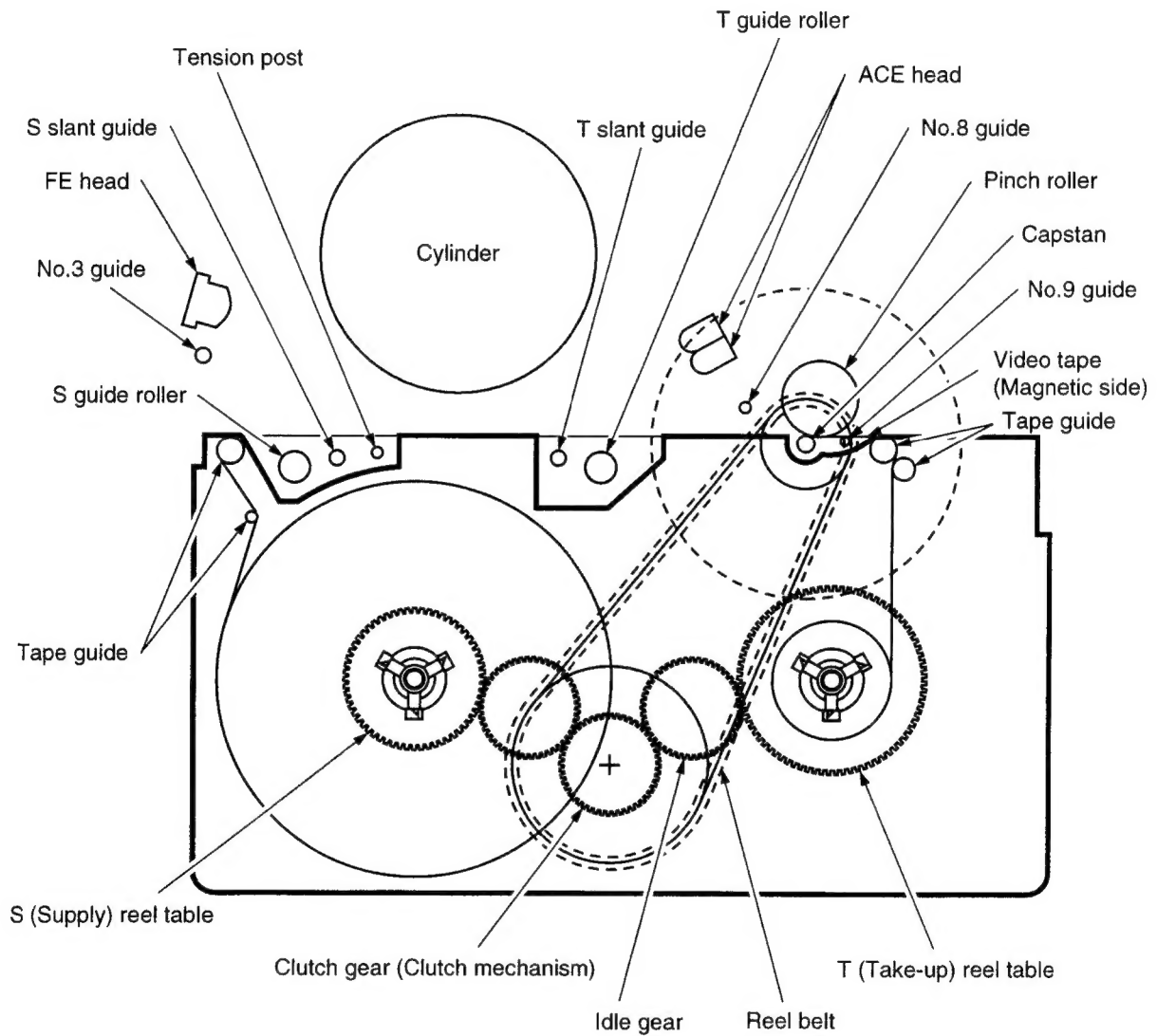


Fig. 1-4-3 Slot-in/Slot-out modes

### 1-4-3. Tape Loading

A full loading system is employed.

In the full loading system, the tape loading starts at the same time when the cassette loading operation has completed and cassette has been mounted, and the tape is pulled out, wrapped around the cylinder and the mechanism enters the stop status under this condition.

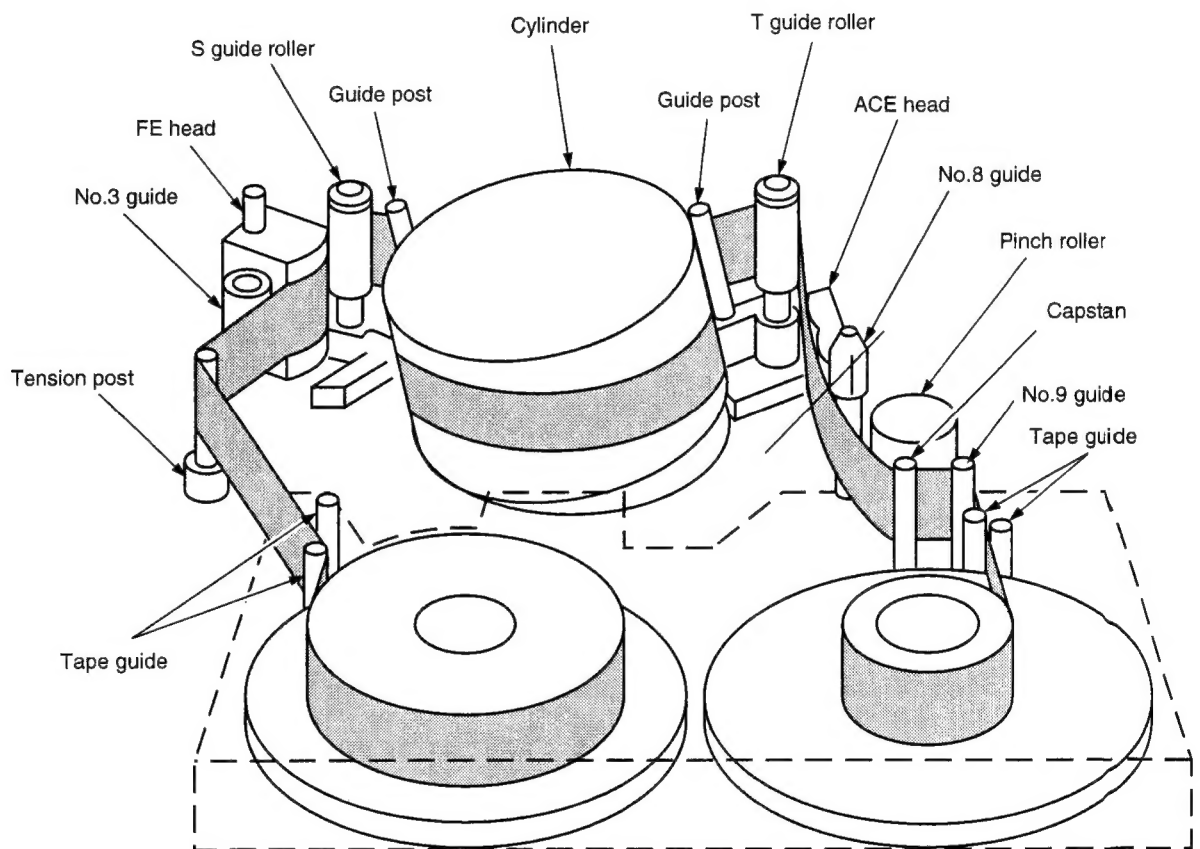


Fig. 1-4-4 Tape loading



#### 1-4-4. Playback Standby Mode

In the full loading system, the tape loading starts at the same time when the cassette mounting has completed, the mechanism shifts to the playback position, and enters the standby status with keeping tape wrapped around the cylinder.

In this case, tape tension applied to the cylinder is decreased to protect the tape and to prevent the tape from scratches.

#### 1-4-5. FF/REW Modes

The reels enter a free status by rotating the loading motor to go to FF/REW position.

In this case, the capstan motor rotates in clockwise direction in the FF mode, and rotates in counterclockwise direction in the REW mode. The idle gear is swung rightward or leftward according to the rotating direction of the capstan motor. As a result, the T reel rotates in the FF mode or the S reel rotates in the REW mode, thus taking up the tape to the rotating reel.

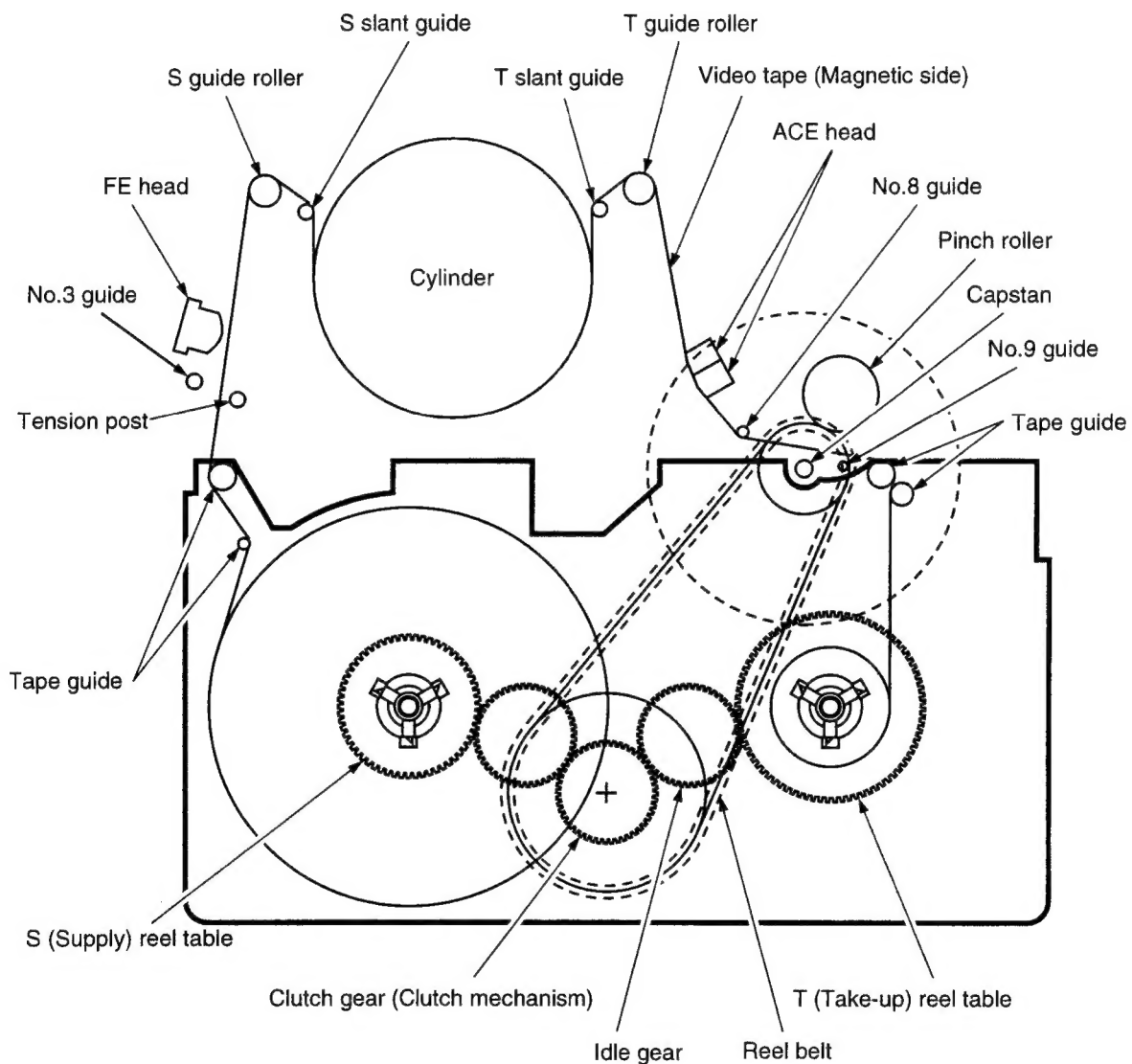
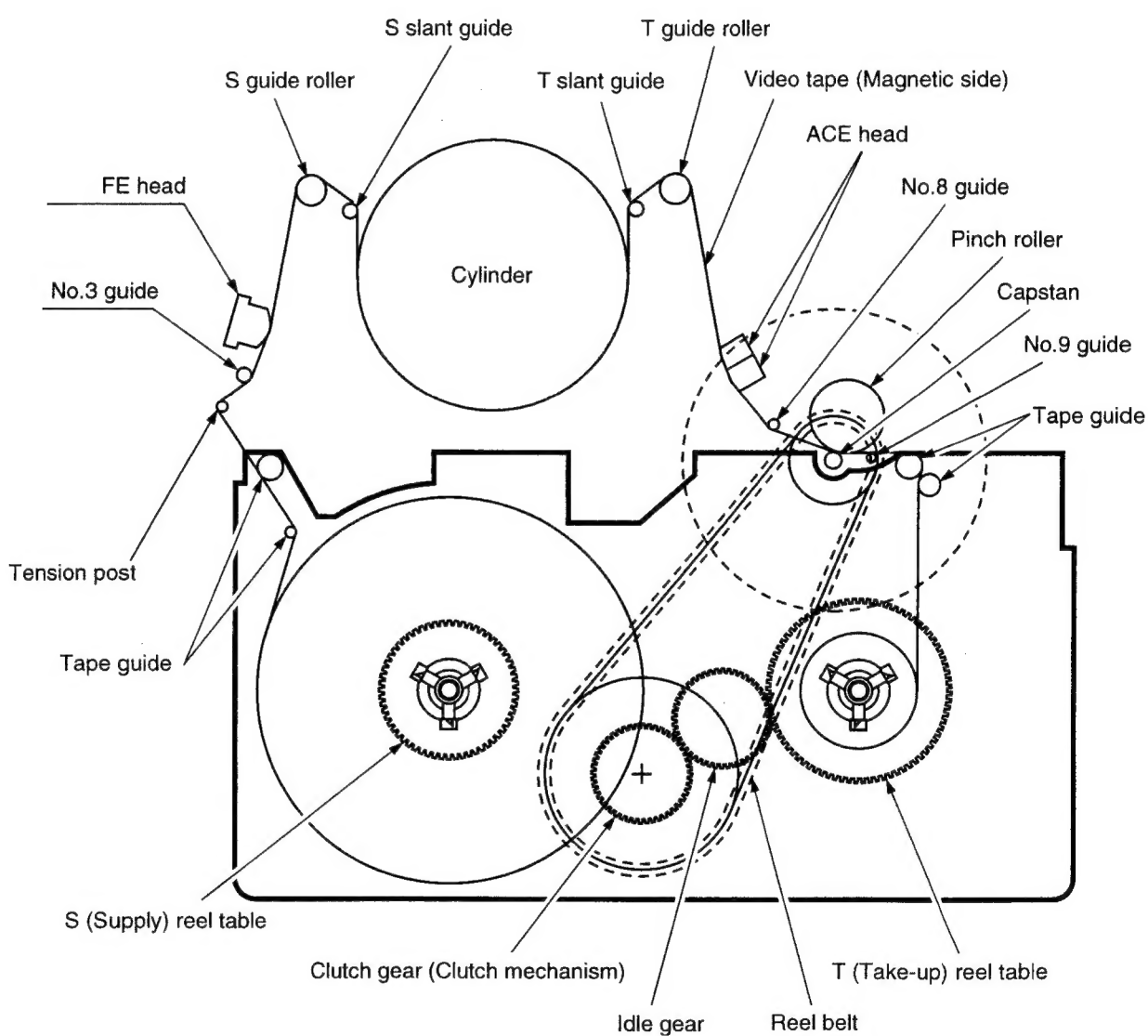


Fig. 1-4-5 FF/REW mode

When the record or playback button is pressed, the tape is fed by the rotation of the capstan motor.

In this case, a tension post touches the tape and a braking force created by the band brake linked with the tension post is applied to the S reel, thereby stabilizing the tape tension. The tape fed by the capstan is taken up around the T reel. The T reel is driven with a constant torque generated by transmitting rotation of the capstan motor to the clutch mechanism.



**Fig. 1-4-6 REC/Playback mode**

## 1-5. System Control

In the VTR, complex mechanism, video, audio, servo circuits, etc. must be operated in specified timings matched each other. The system control circuit performs entire controls for the VTR.

An automatic stop function is also provided to protect important tape if a trouble occurs on the complex mechanism and the electrical circuits.

For this purpose, status of each part of the mechanism is always monitored with various sensor switches, and the microcomputer controls collectively the unit so that the best condition is kept.

Moreover, the microcomputer controls signal switchings for each circuit according to the mechanism status.

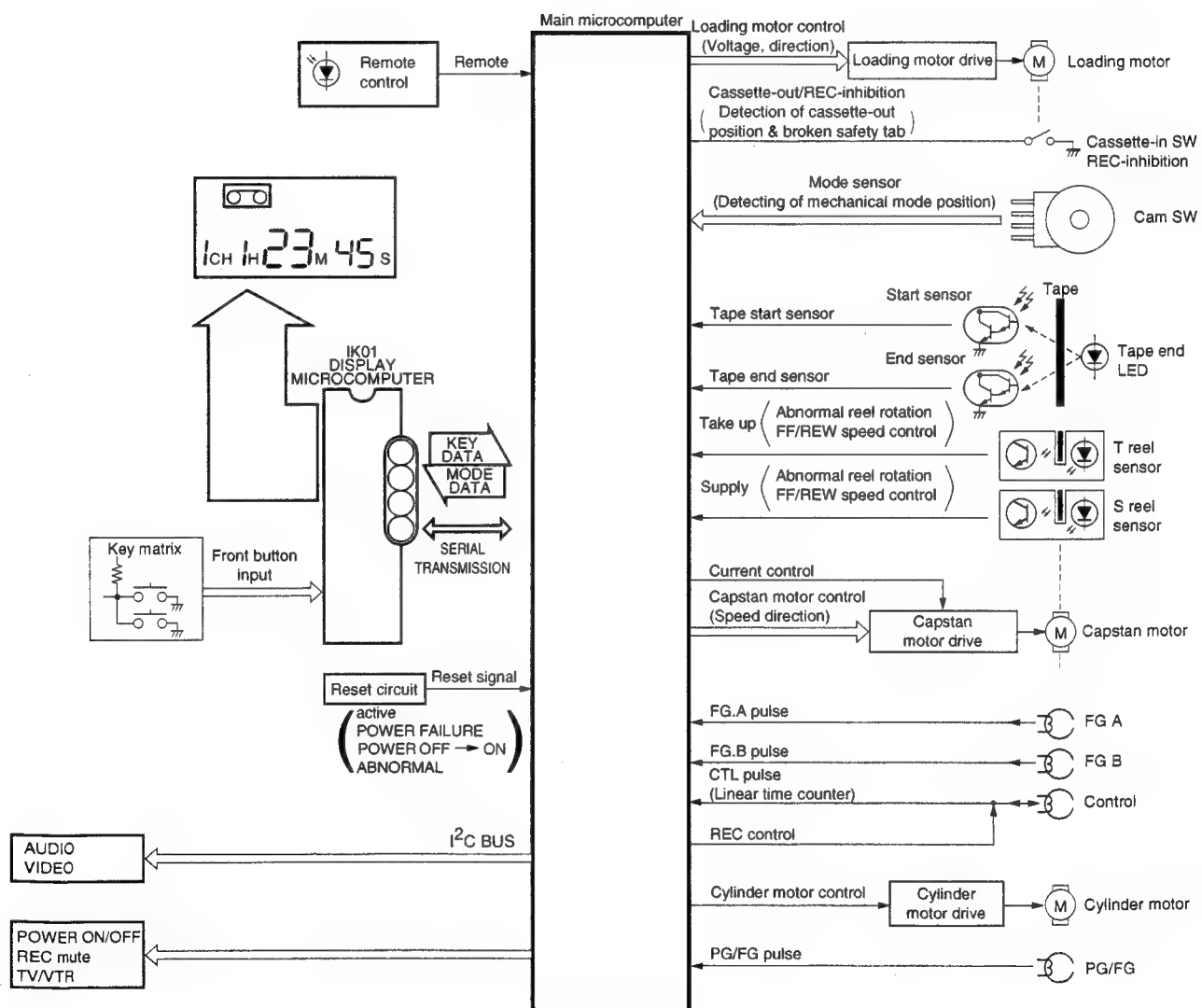
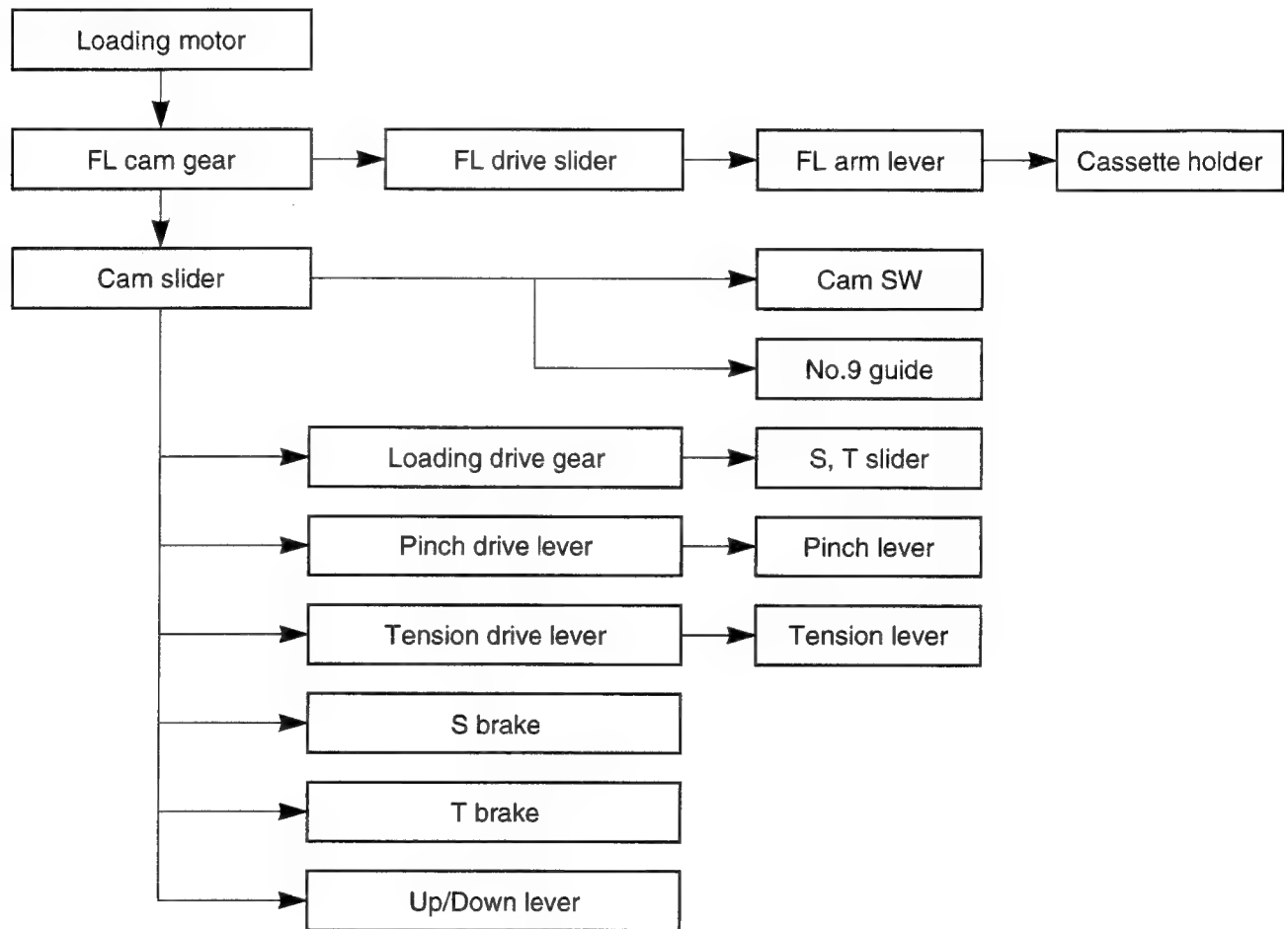


Fig. 1-5-1 System control block diagram

## 1-6. System Control and Mechanical Operations

### 1-6-1. Mechanical Operation

The operation of mechanism is performed by rotation of the loading motor, and the transmission path of the operation is as shown in Fig. 1-6-1.



**Fig. 1-6-1 Transmission path of operation**

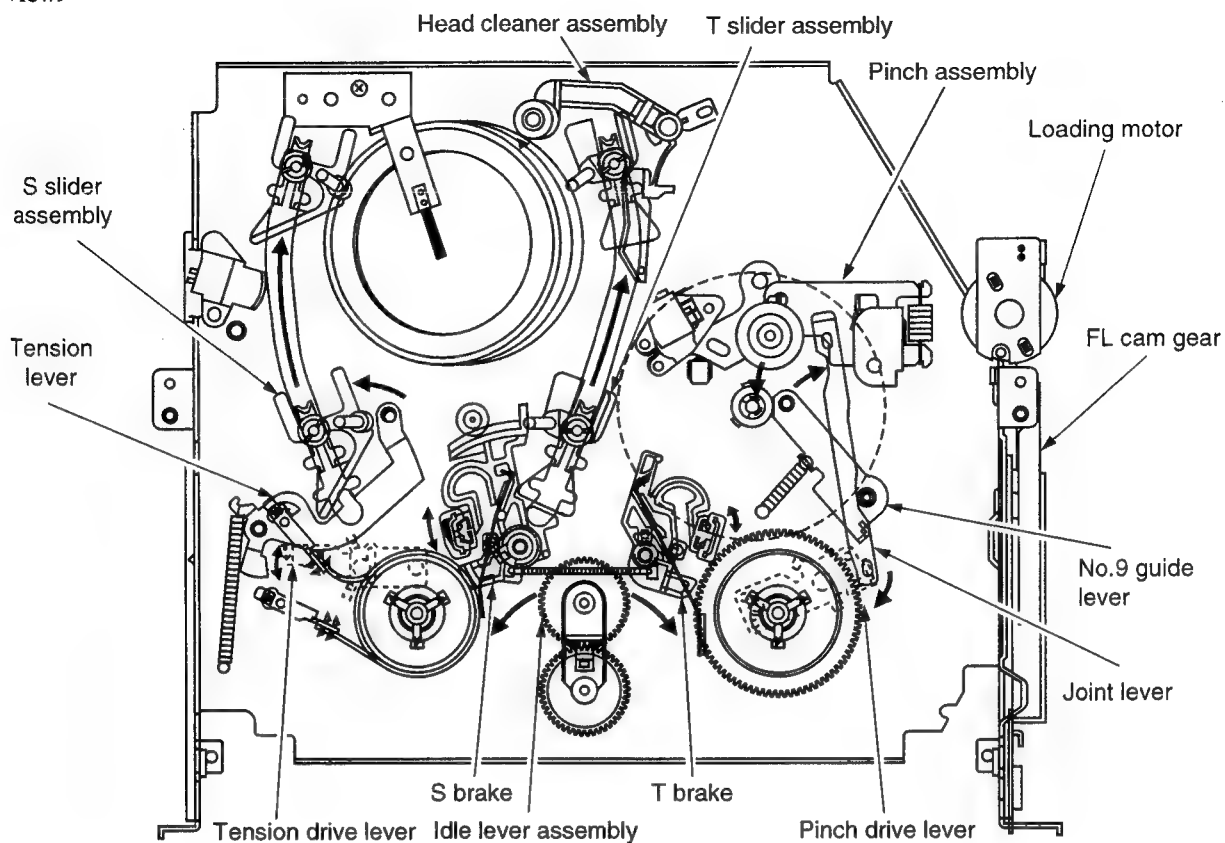
Fig. 1-6-3 shows each mode and mechanism status in each mode concerned with the rotation of the FL cam gear or cam slider shift. The mechanism operates as shown in Fig. 1-6-2 according to the timing chart in Fig. 1-6-3.

**Note:**

The cassette-in switch is actuated by the REC-inhibiting lever which has functions of detecting cassette insertion and REC-inhibiting, and turned on or off by insertion or ejection of a cassette.

(The cassette-in switch and the REC-inhibiting lever are used to detect a cassette during the cassette-up operation, and they are used to detect REC-inhibiting during the cassette-down operation.)

<Top View>



<Bottom View>

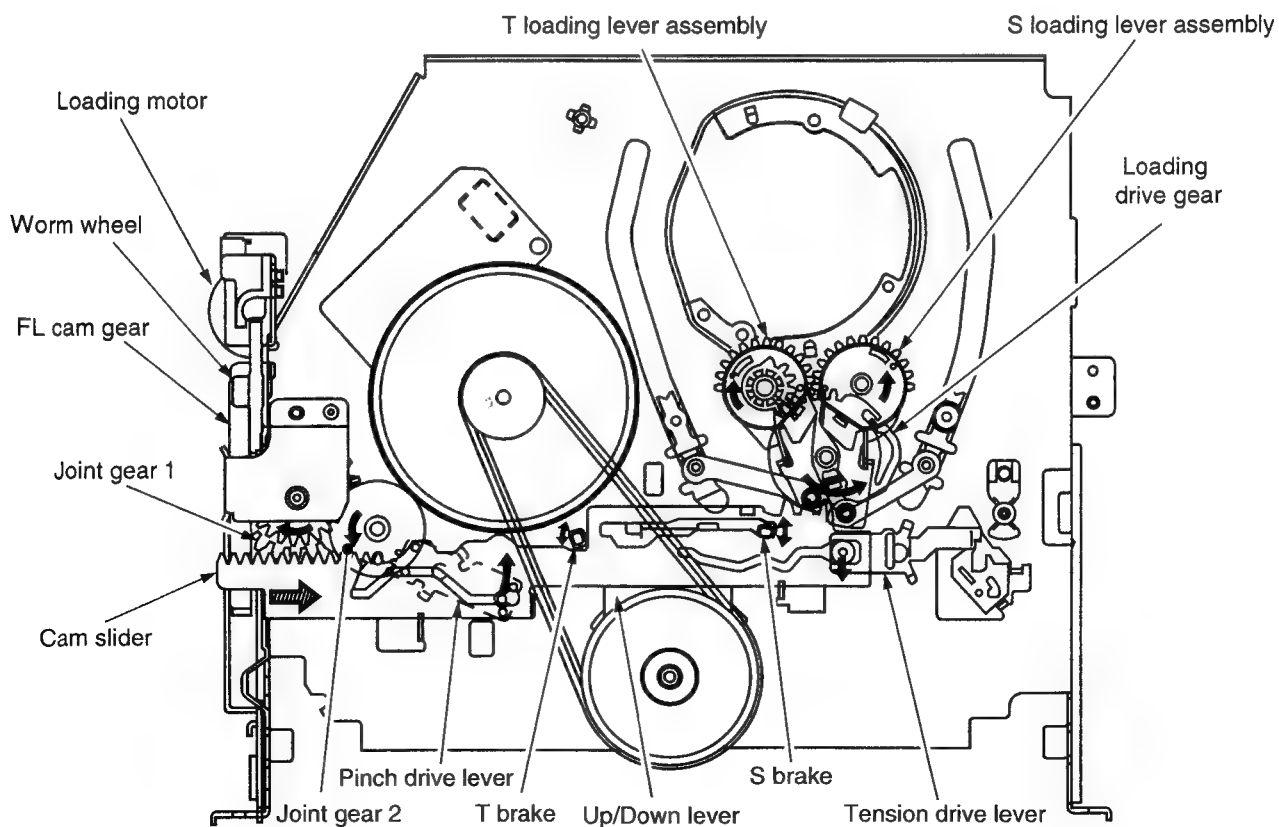


Fig. 1-6-2 Mechanical operation

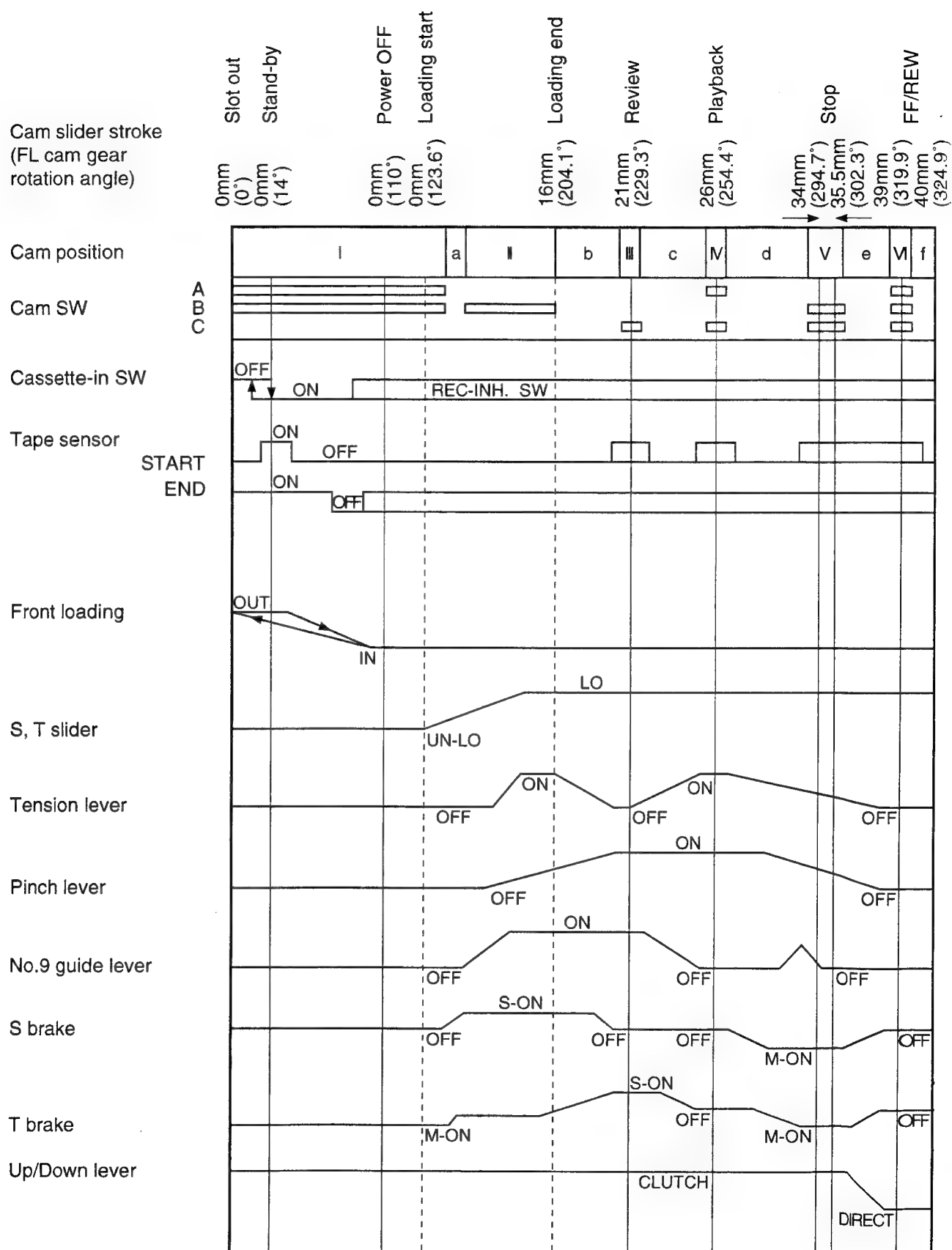


Fig. 1-6-3 Cam timing chart

### 1-6-2. Mode Sensor Drive

The mode sensor converts each mode of the mechanism into an electrical signal and transmits it to the microcomputer. The FL cam gear is rotated by the loading motor, and the cam slider slides after operation of the cassette holder. Then, the cam switch also rotates synchronized with the cam slider and outputs a signal corresponding to each mode. This signal is transmitted to the microcomputer and the microcomputer stops the cam slider at a specified angle, thus establishing each mode.

The IT001 controls IT002 for each mode to make the loading motor rotate in forward or reverse direction, thereby setting the mechanism at a specified position. The cam switch develops three outputs A, B, and C. The circuit configuration of the mode sensor drive is shown in Fig. 1-6-4.

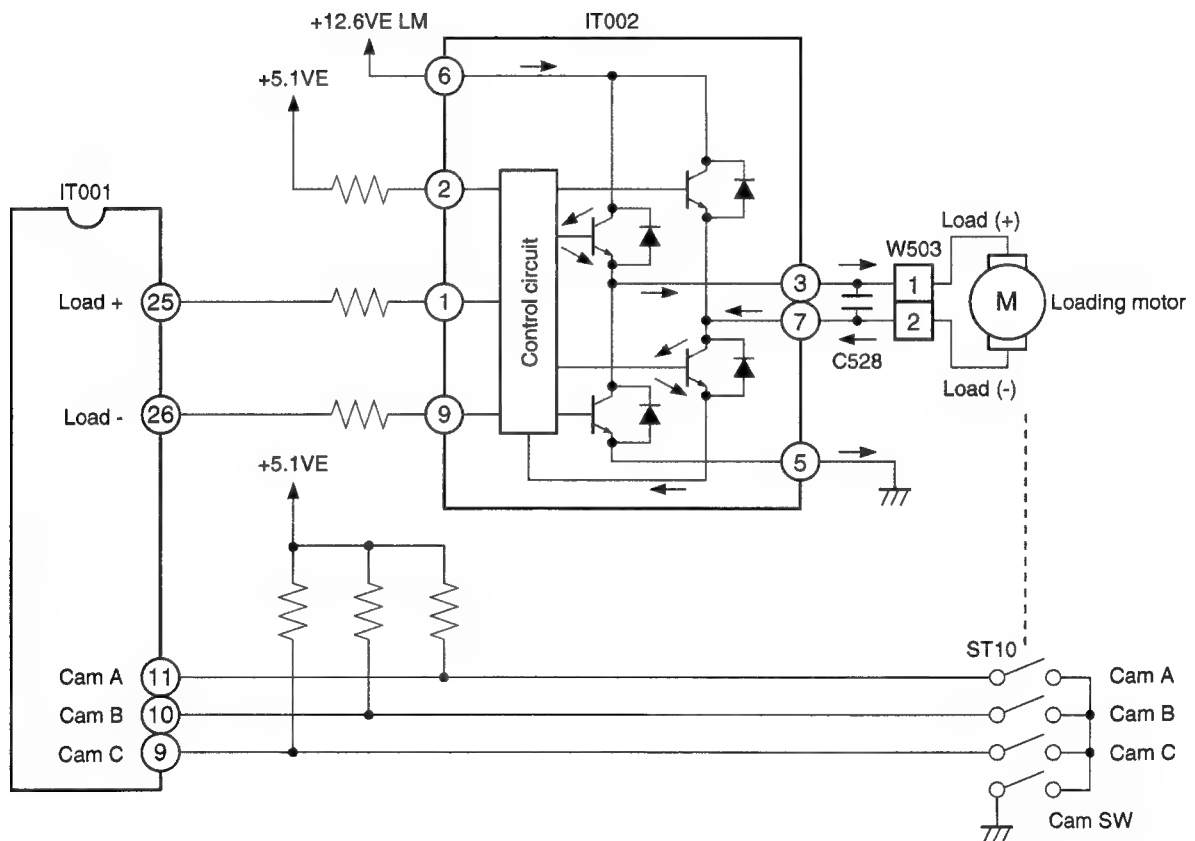


Fig. 1-6-4 Mode sensor drive

### 1-6-3. Operations in Each Mode

(1) Slot-in (cassette loading) → Tape loading mode

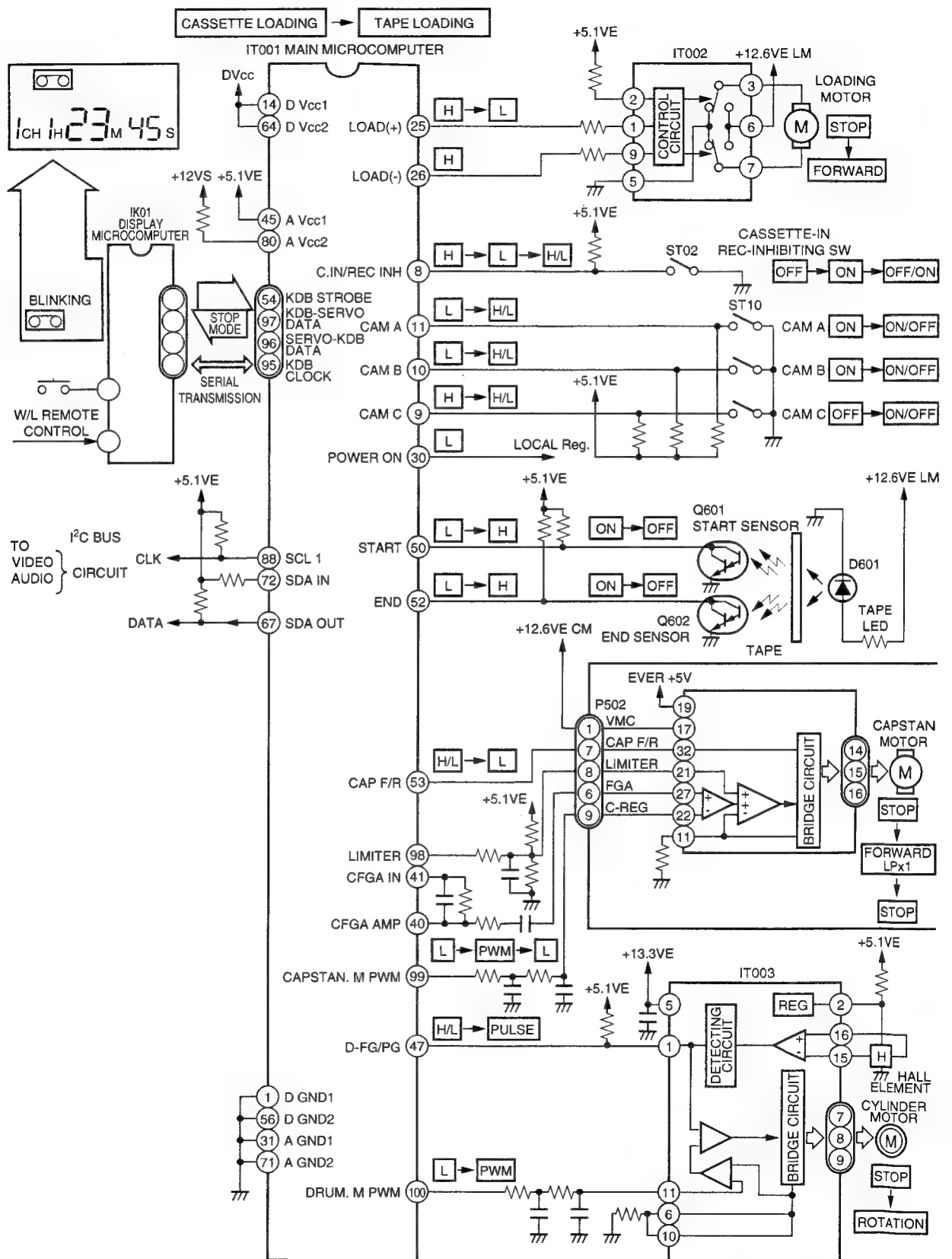


Fig. 1-6-5



### <Slot-in (cassette loading)>

1. The FL cam gear is in the slot out (cassette unloading) (position I) position, and the cassette holder is in the out status (cassette-in switch off). Under this condition, each motor is stopped.
2. Status of the mechanism is as follows.
  - 1) S, T guide rollers, tension post, No.9 guide are in unloading status and housed in the reel table side.
  - 2) S brake is released and T main brake is turned on.
  - 3) The clutch gear assembly is in clutched status and idle lever assembly is enabled to be engaged with both S and T reel tables.
3. When a cassette is inserted, the lock lever of cassette holder is released from the stopper, the cassette holder moves, the FL arm lever rotates, and the REC-inhibiting lever rotates, thereby turning on the cassette-in switch.
4. IT001 controls IT002 to rotate the loading motor in forward direction, and move the cassette holder. At the same time, the capstan motor rotates in the forward direction (LPx1) and moves the cassette down (vertical motion) while rotating the T reel table.
5. The cassette lid opens when the vertical motion starts.
6. When the vertical motion has completed and the cassette is mounted, the position "a" is detected with the cam slider shifted and the capstan motor is stopped. However, the loading motor does not stop, and enters the tape loading operation.

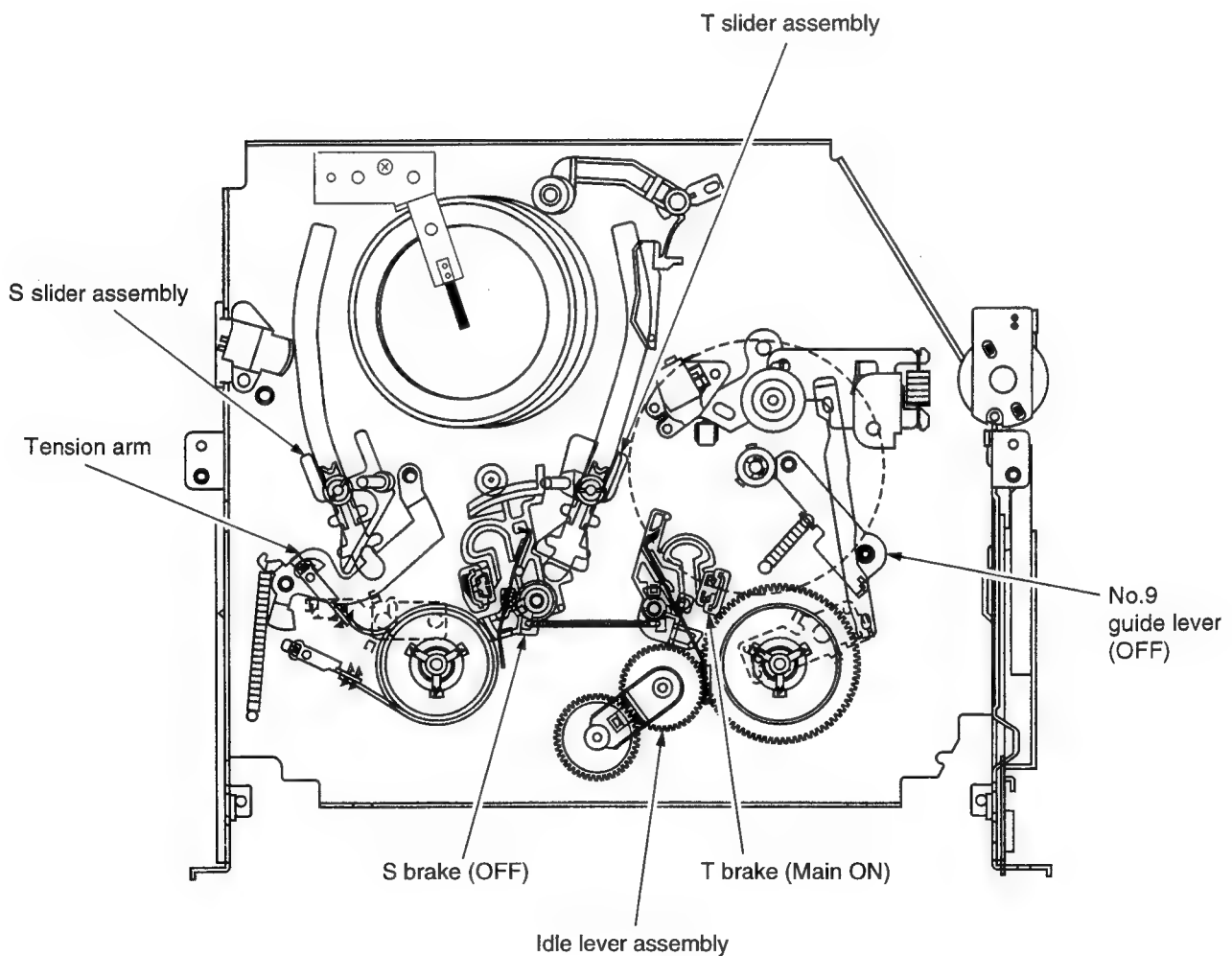


Fig. 1-6-6 Slot-in mode (Position I)

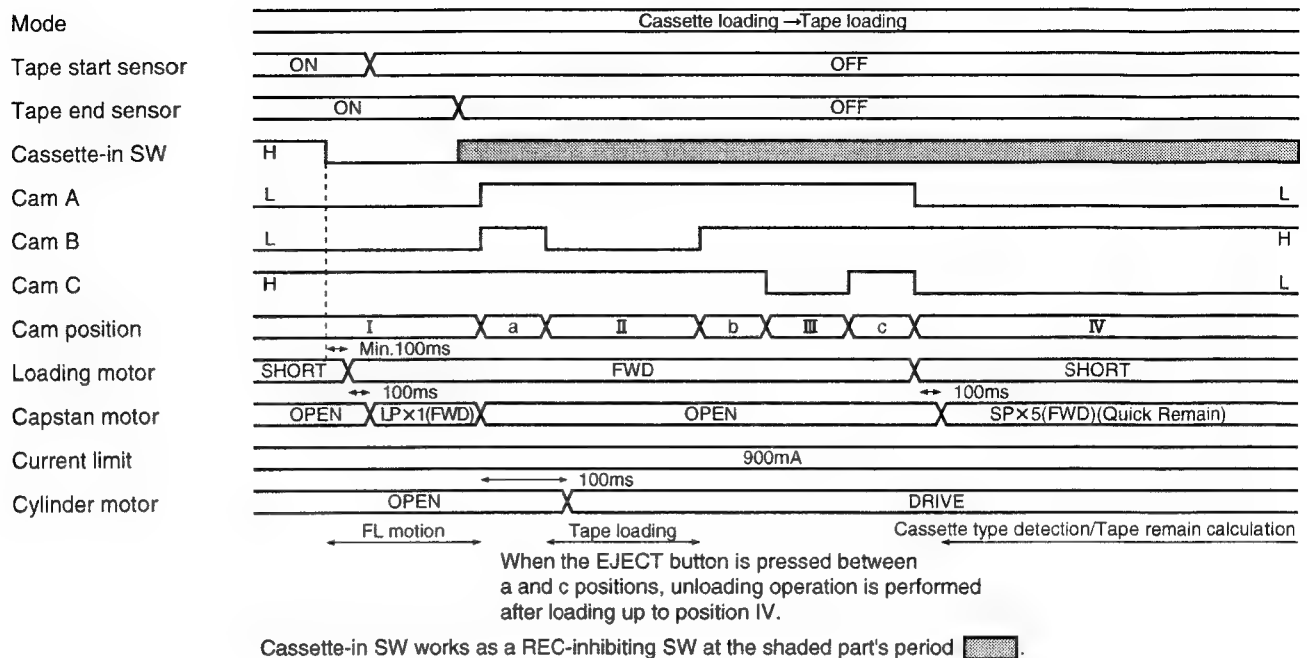


Fig. 1-6-7 Cassette loading → Tape loading

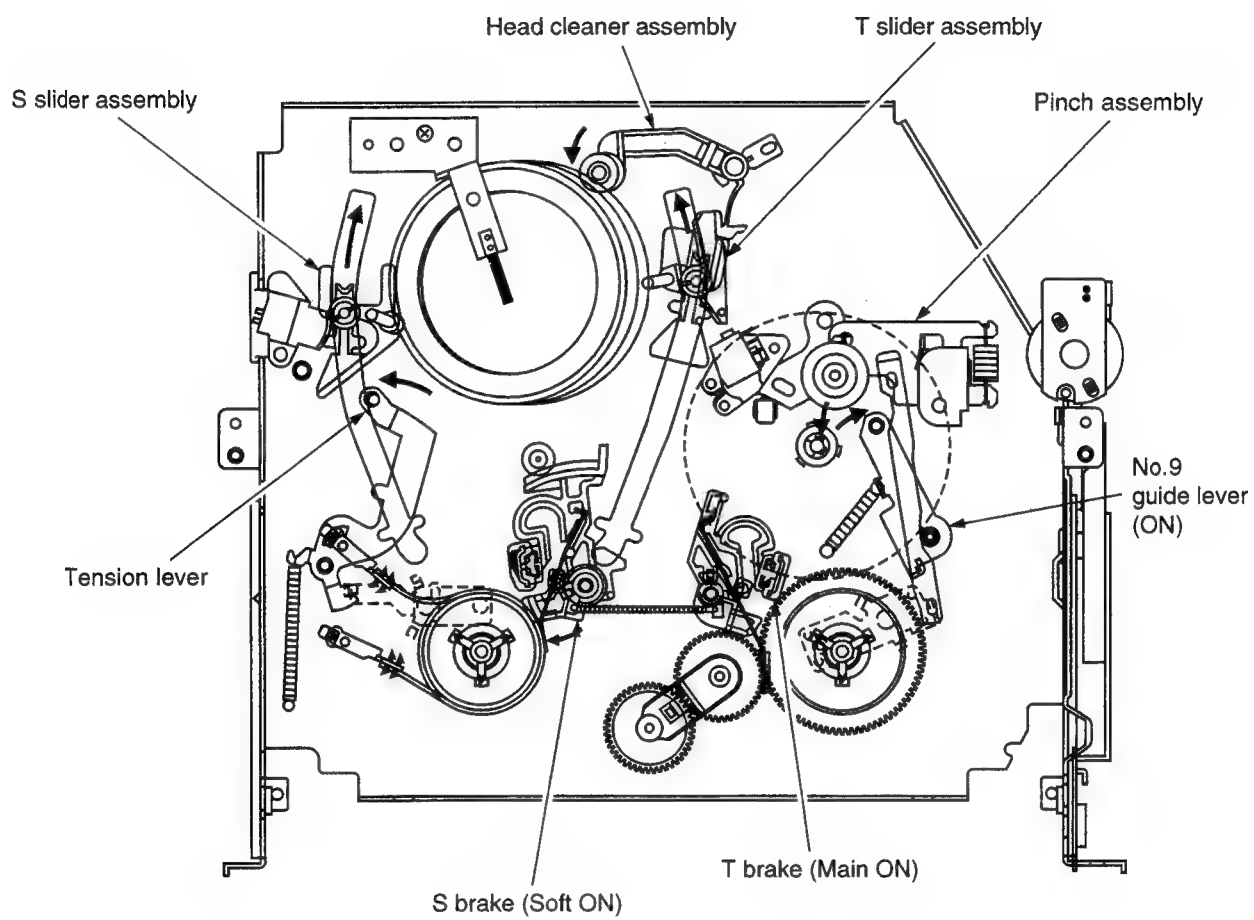
#### <Tape loading>

- After slot-in operation (cassette loading), FL cam gear rotates and the cam slider starts shifting, and a loading is ready to start. Under this condition, the mechanism status is as follows:
  - The T main brake actuates so that tape does not come out from the T reel during the loading operation.
- The cylinder starts to rotate 100ms after the cam slider passed away from the position I.
- When the cam slider reaches the position II (loading/unloading modes), the mechanism enters the loading status and operates as described below.
  - S, T sliders are moved through the loading drive gear and turn on the tension post.
  - The No. 9 guide is loaded.
  - The pinch roller is loaded up to front of the capstan.
  - The head cleaner is actuated during loading operation.
  - The S soft brake is actuated.

- When the cam slider passes through the position III, and detects the position IV (playback mode), the loading motor stops. Under this condition, the mechanism status is as described below:
  - The pinch roller is pressed to the capstan.
  - The No. 9 guide is stored in the cassette.
  - The tension post touches the tape, band brake force is applied, and the tension servo brake mechanism actuates.
  - Brakes for the reel tables are all off.
- In the position IV, the mechanism enters the cue mode and a cassette type is detected by detecting rotating cycle of the S and T reel tables.
 

When the detection completes, the loading motor rotates in forward direction to shift to V position, and then reverse direction to enter position III (review mode). The loading motor returns to the position before completion of tape detection.

For this period, the video and audio systems are in the same status as those in the stop mode.
- When the rewind operation completes, the loading motor rotates in forward direction and stops after the cam slider has reached the position IV (playback standby mode).



**Fig. 1-6-8 Tape loading operation (Position II)**

<Playback Stand-by (Stop) mode>

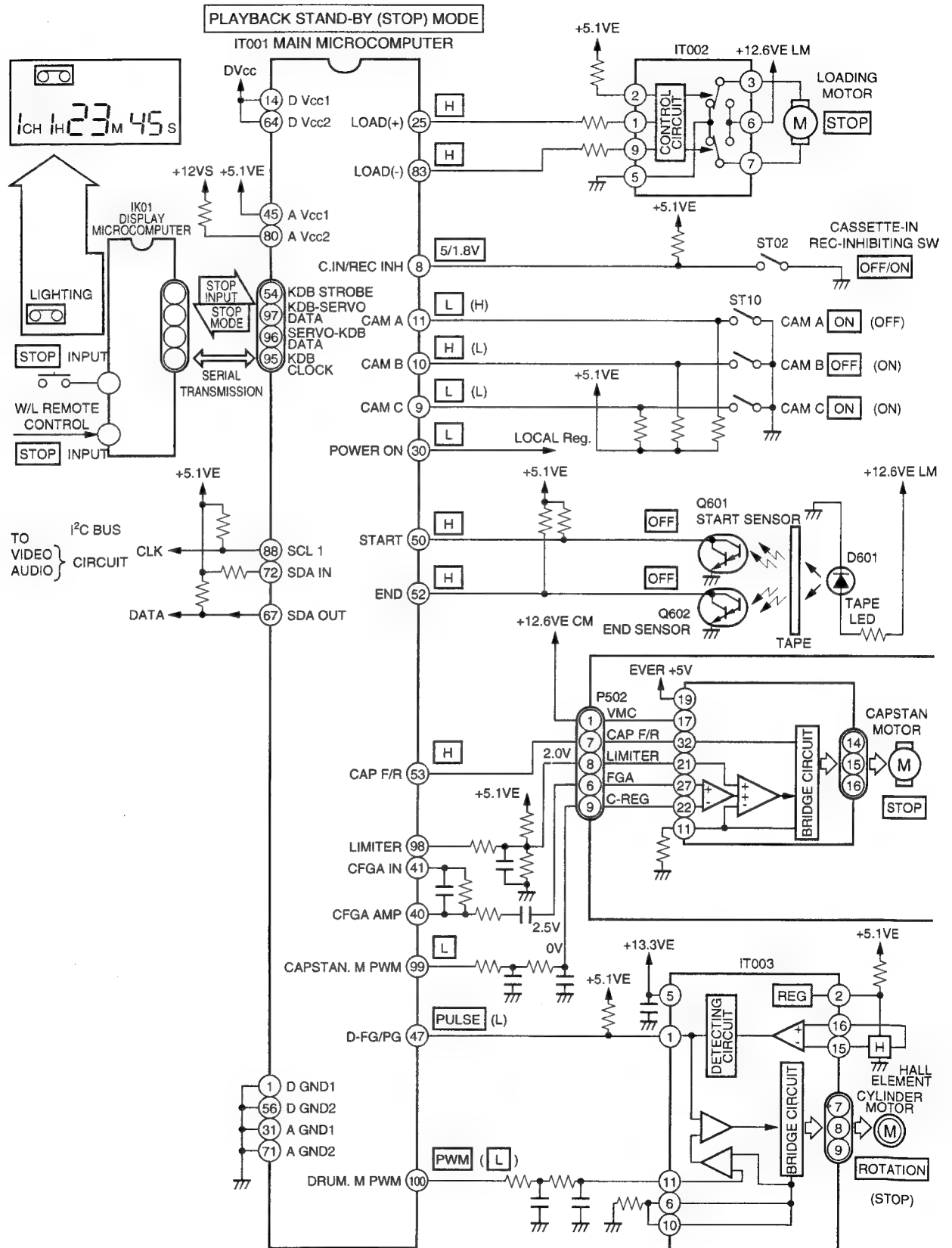


Fig. 1-6-9

1. The tape loading operation completes and the loading motor stops.
2. In the same way as in the playback mode, the capstan motor rotates in forward direction (x1) and the T reel table takes up the tape. (For more details, refer to the playback mode.)
3. After running the tape for about 0.5s, the mechanism rotates the capstan in the reverse direction (LPx1) to slack the tape properly with pinch roller pressed.
4. If nothing is operated for about 5 minutes, the loading motor rotates in the forward direction and the cam position reaches the position V, and both the loading motor and the cylinder motor stop.
5. During this period, the video and audio systems are in the same status as in the stop mode.

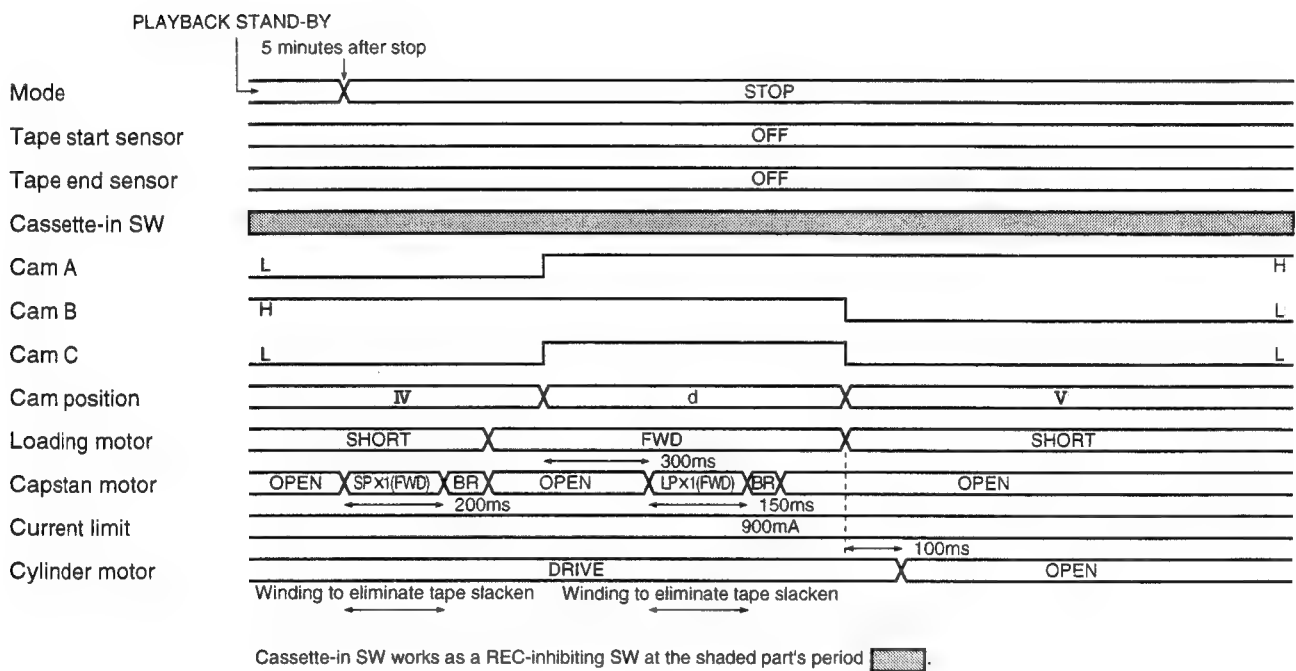
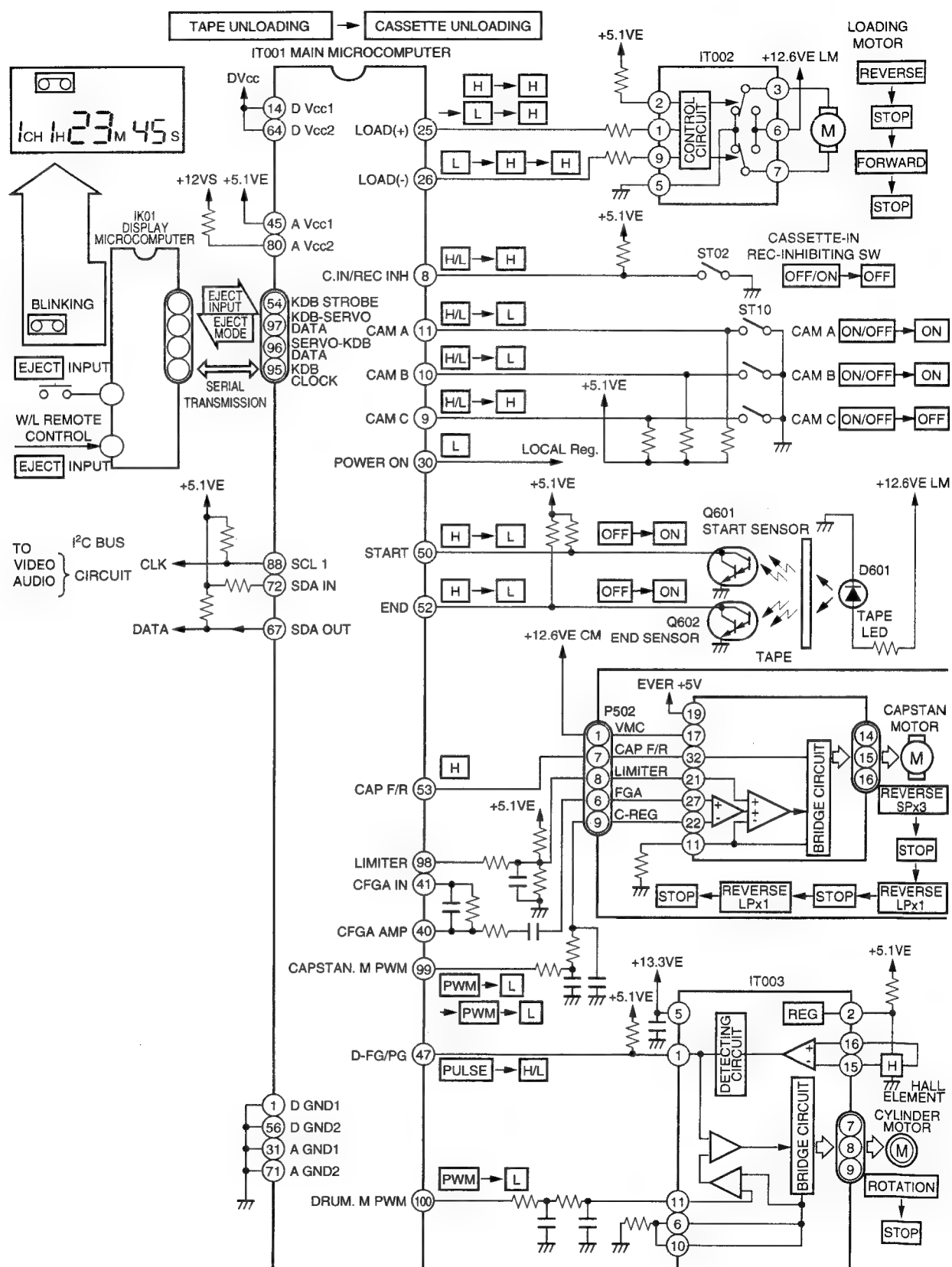


Fig. 1-6-10 Playback stand by → Stop

**(2) Tape unloading → Slot out (Cassette unloading)**



**Fig. 1-6-11**

### <Tape Unloading>

1. When the [EJECT] button is pressed in the stop mode, the mechanism enters the eject mode.
2. IT001 controls IT003 to make the cylinder motor rotate.
3. IT001 makes the loading motor rotate in the reverse direction, and shifts the cam slider.
  - 1) The mechanism components move in the reverse direction against the loading operation.
4. When the cam slider reaches the position II, IT001 makes the capstan motor rotate in the reverse direction (SPx3) and takes up the tape at a specified torque using the clutch mechanism.
5. When the cam slider reaches the position I, it brakes the capstan motor to stop, and then stops the loading motor after 200ms passed.

### <Slot out (cassette unloading)>

1. Furthermore, IT001 makes the loading motor rotate in the reverse direction and also the capstan motor in reverse direction (LPx1), applies braking force to the capstan motor by detecting the tape start sensor ON → OFF, and the capstan motor stops.
2. Next, IT001 makes the capstan motor rotate in the forward direction (LPx1), stops the loading motor once 300ms after activation of the capstan forward rotation, then makes it rotate in forward direction again, thereby both motors stop by detecting the tape start sensor OFF → ON. Under this condition, next cassette insertion will be allowed.

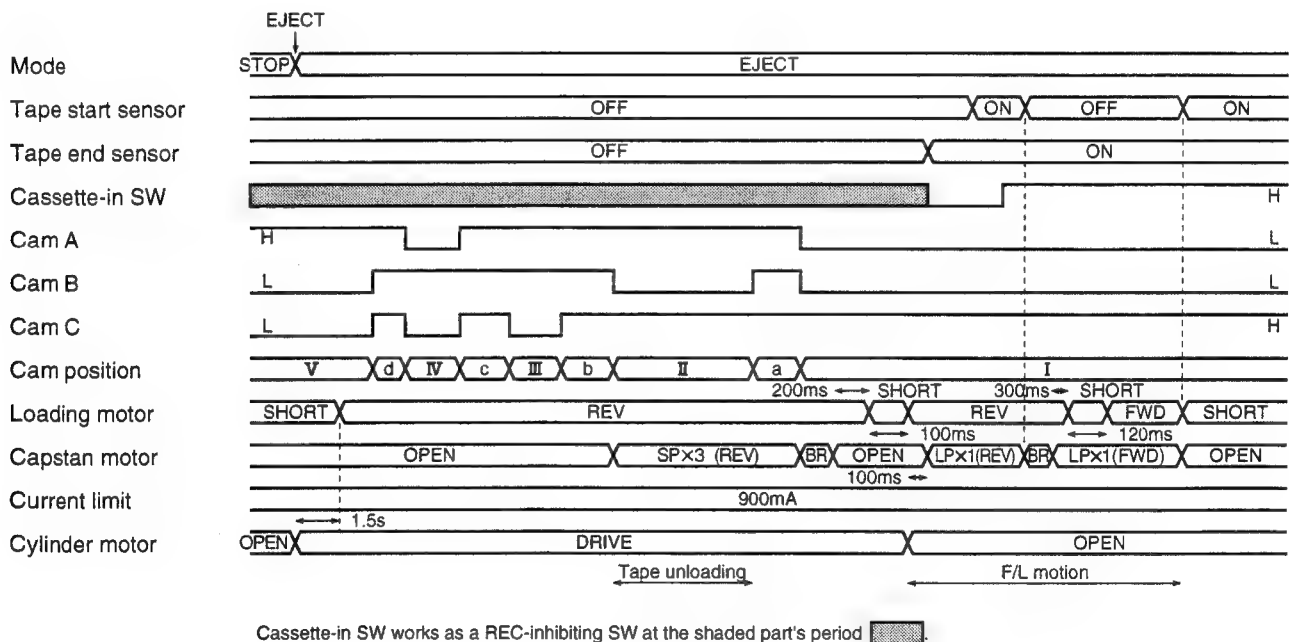


Fig. 1-6-12 Tape unloading → Cassette unloading

### (3) Stop mode

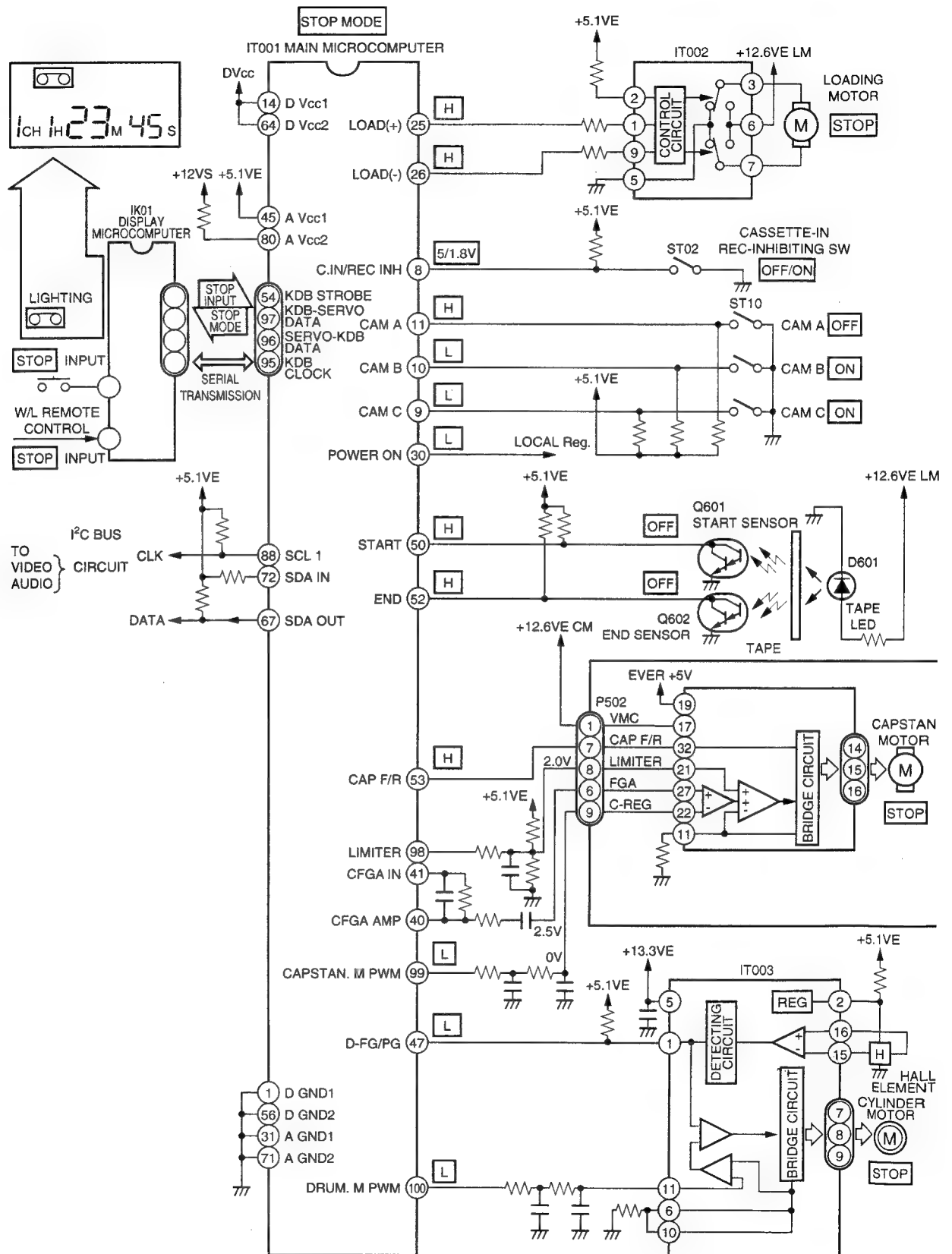
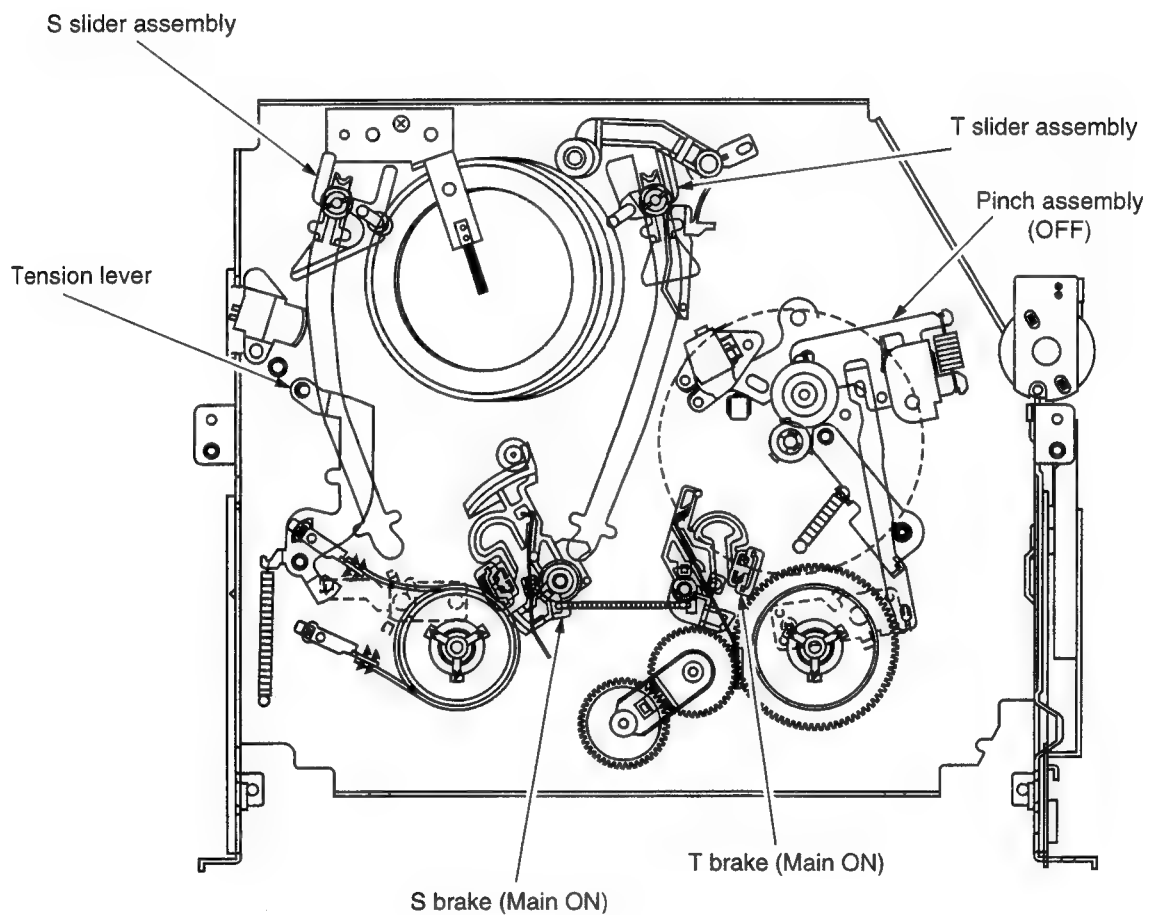


Fig. 1-6-13



1. The cam slider is in the stop mode (position V) and each motor stops.
2. The mechanism status is as follows:
  - 1) The S, T guide rollers are in the loading status.
  - 2) The pinch roller is kept away from the capstan.
  - 3) The tension post is shifted to the reel table side.  
That is, the band brake is released from the ON status and the back tension is also released.
  - 4) The S, T main brakes are being applied.



**Fig. 1-6-14 Stop mode (Position V)**

#### (4) FF/REW mode

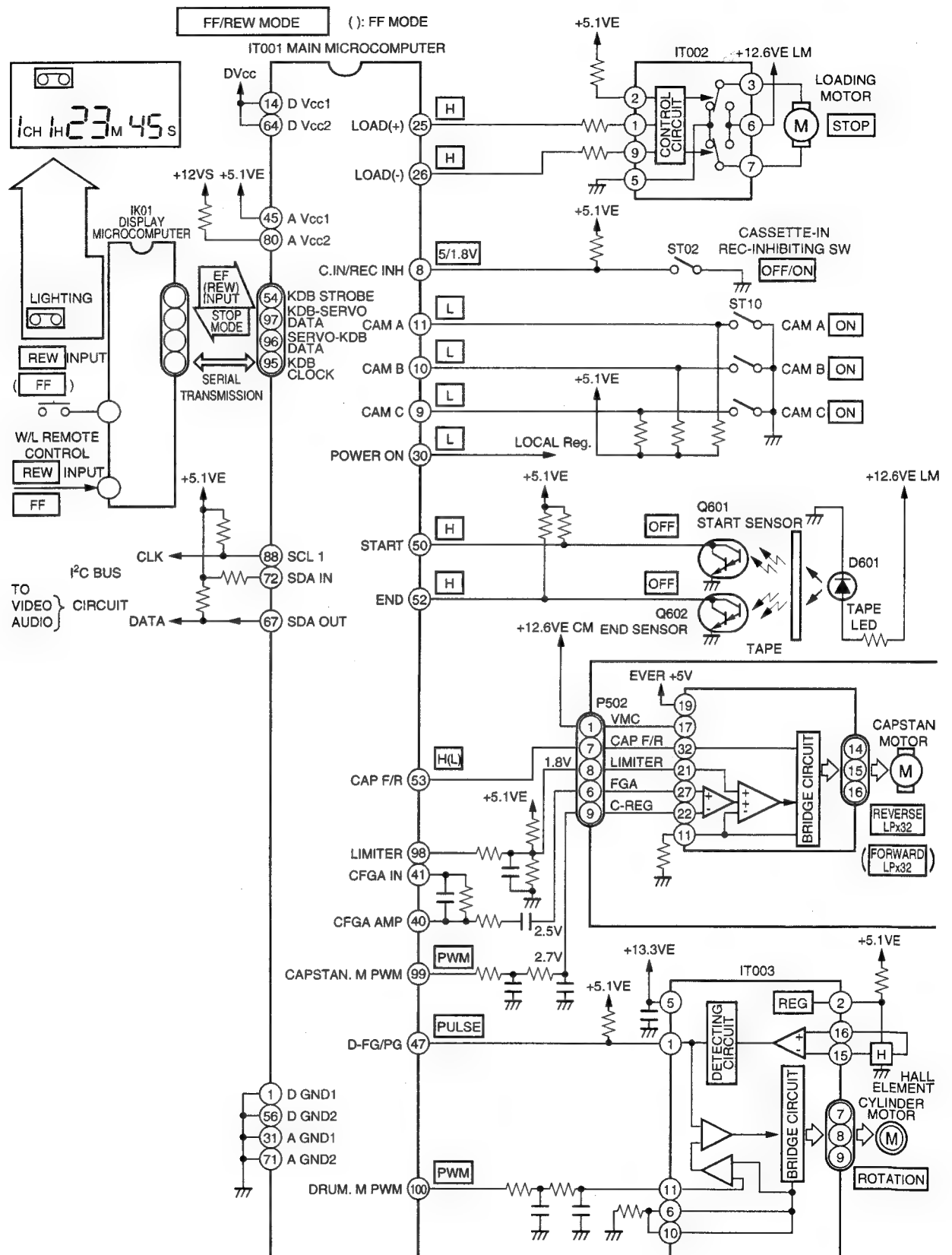


Fig. 1-6-15 FF/REW mode (Position VI)

1. When the [REW] button is pressed in playback standby mode, the mode enters the FF/REW mode.
2. IT001 controls IT002 and makes the loading motor rotate in the forward direction. The loading motor stops when the cam position reaches the position VI (FF/REW mode).

The mechanism status is as follows:

- 1) The pinch roller is OFF.
- 2) The No. 9 guide is once loaded but immediately returned.

- 3) The tension post is moved to the reel table side. That is, the band brake is released from the ON status and the back tension is released.
  - 4) The clutch gear assembly is in the direct status and the capstan driving force is directly transmitted to the reel table.
  - 5) All brakes for the reel tables are OFF.
3. IT001 makes the capstan motor rotate in the reverse direction (LPx1 - after start of about 0.5s in LPx1) and the idle gear transmits the rotation to the S/T reel tables to take-up the tape.

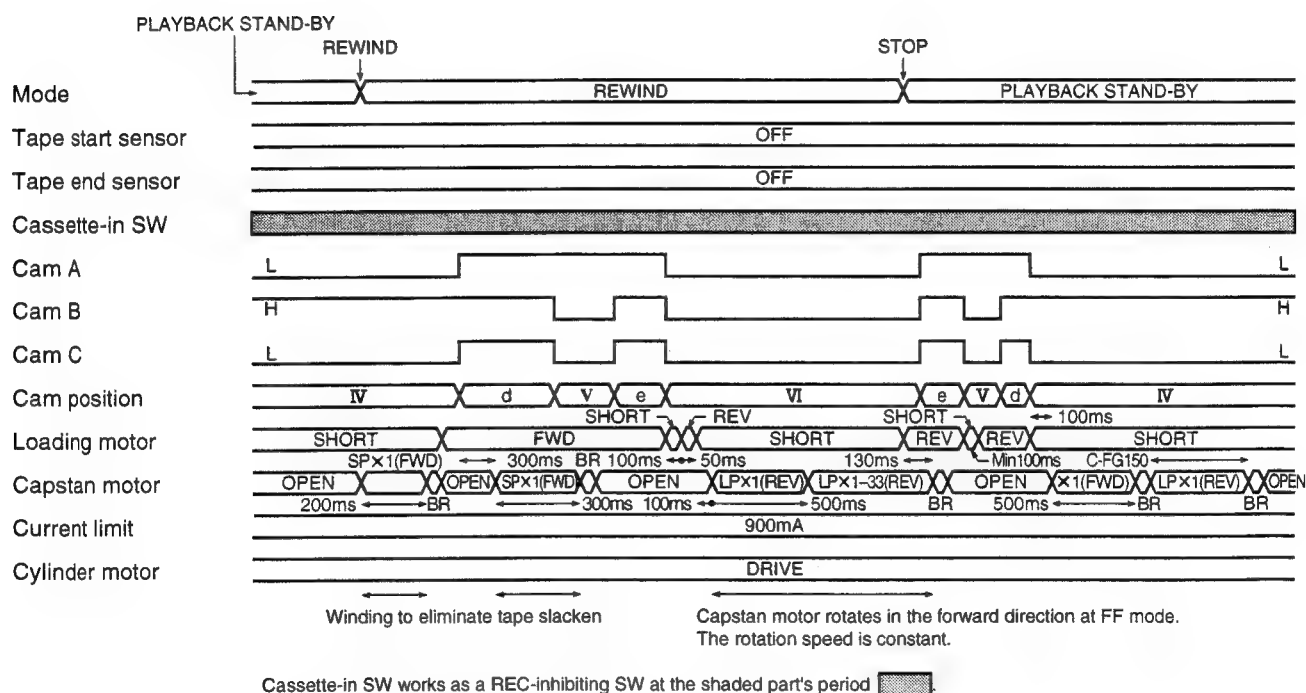


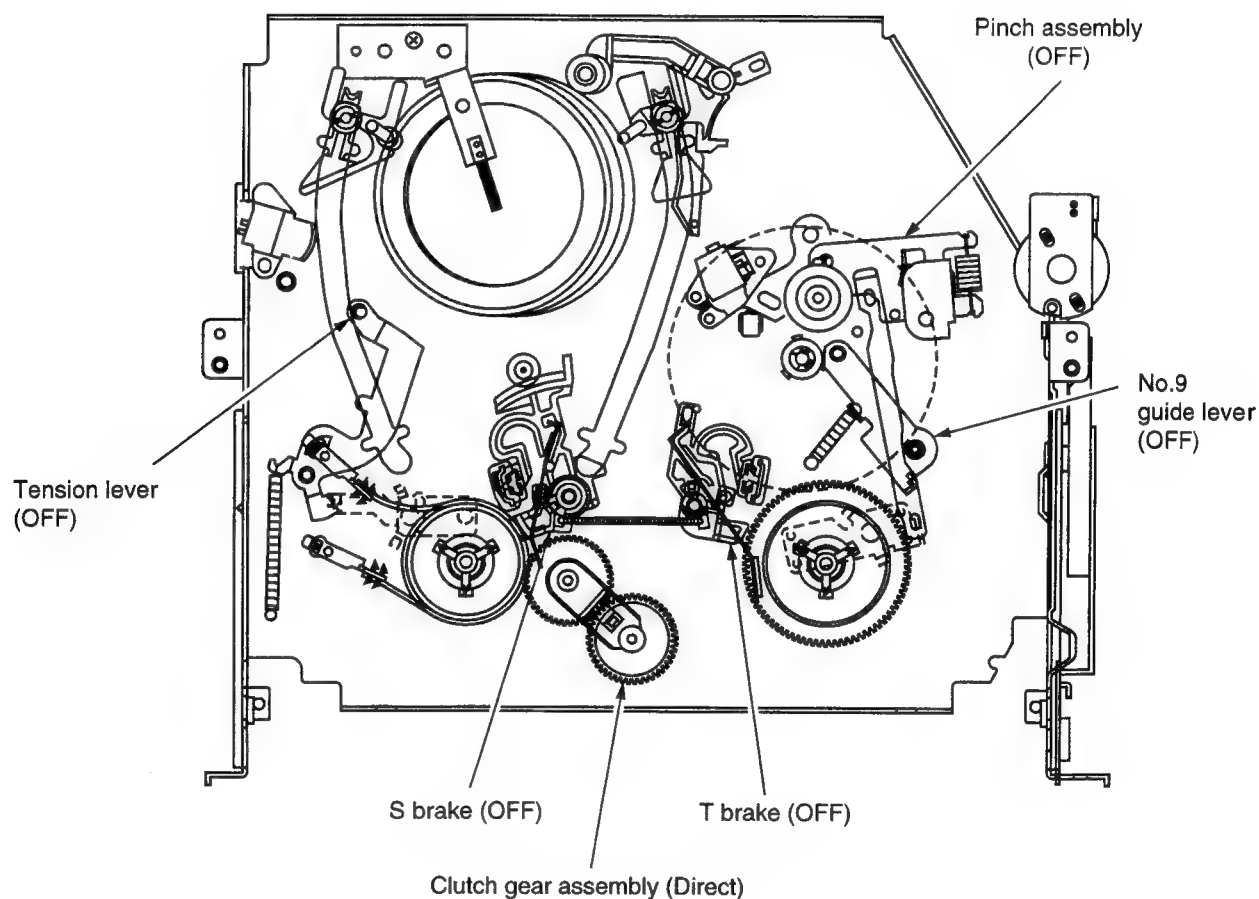
Fig. 1-6-16 Playback standby → REW, REW → Playback standby

**(5) FF/REW to STOP mode**

1. When the [STOP] button is pressed in the REW mode, the mechanism enters the playback standby mode.
2. IT001 makes the loading motor rotate in the reverse direction and stops at the position V. With this mode shift, the mechanism actuates S, T main brakes to stop the tape.

Then, the capstan motor also stops by braking force 130ms after start of reverse rotation of the loading motor.

3. IT001 makes the loading motor rotate in the reverse direction again and stops the loading motor when the cam slider reaches the position IV (playback mode), thus setting the playback standby mode.



**Fig. 1-6-17 FF/REW mode (Position VI)**

## (6) Playback mode

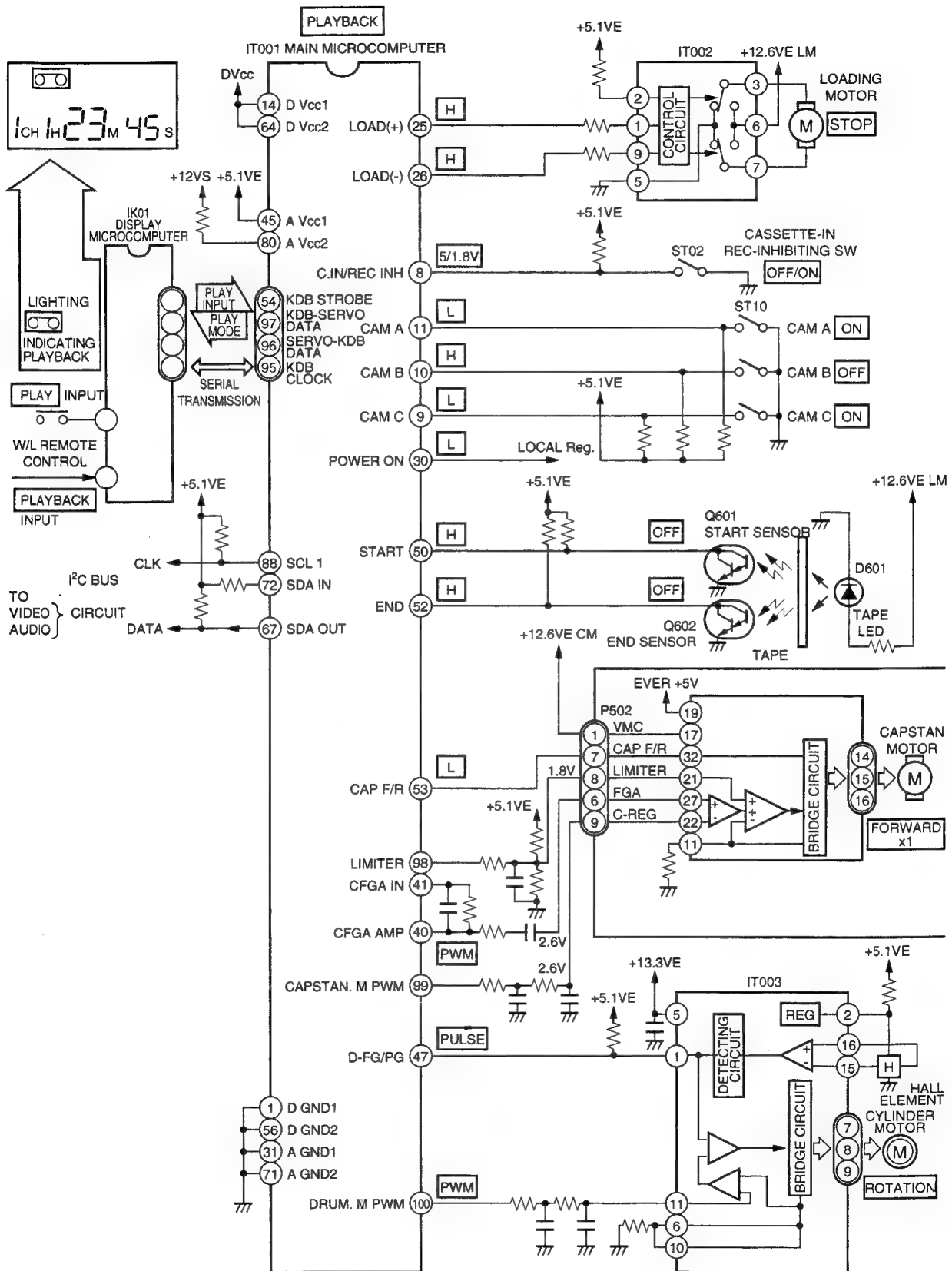


Fig. 1-6-18

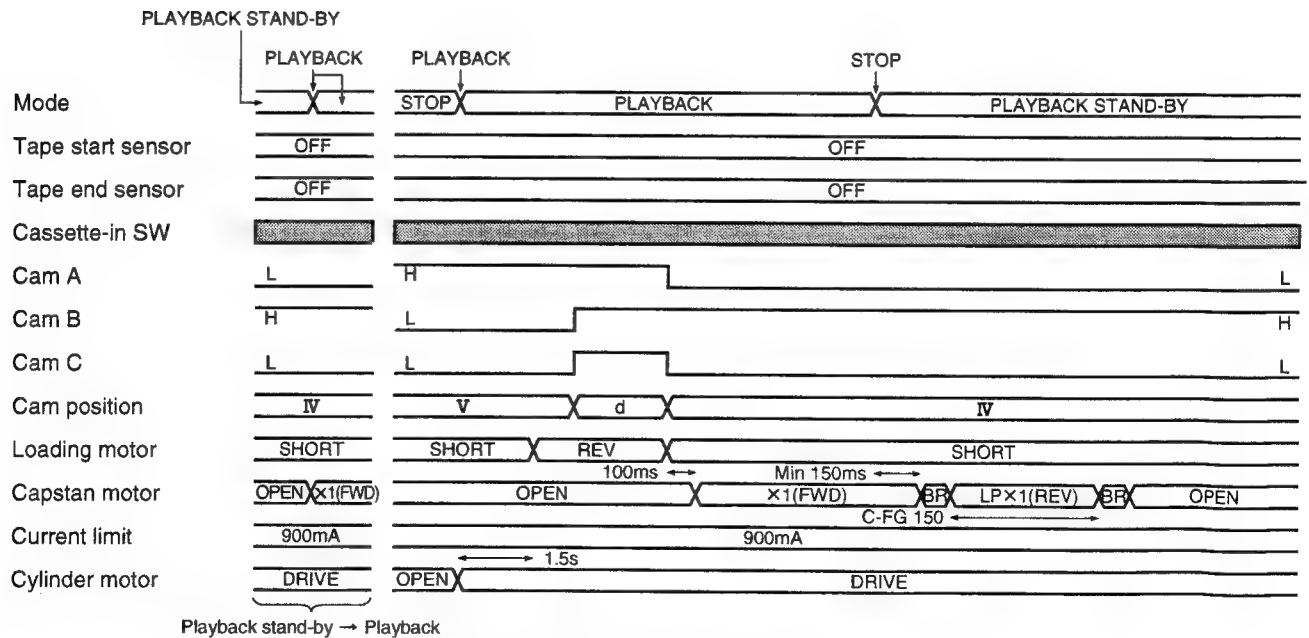
### <Playback mode>

1. When the [PLAY] button is pressed in the stop mode, the mechanism enters the playback mode.
2. IT001 controls IT003 and rotates the cylinder motor.
3. IT001 controls IT002 to rotate the loading motor in the reverse direction and stops the motor when the cam slider reaches the position IV (playback mode). (When operating from the playback standby mode, the cam slider has been already on the position IV.)

The mechanism works as follows:

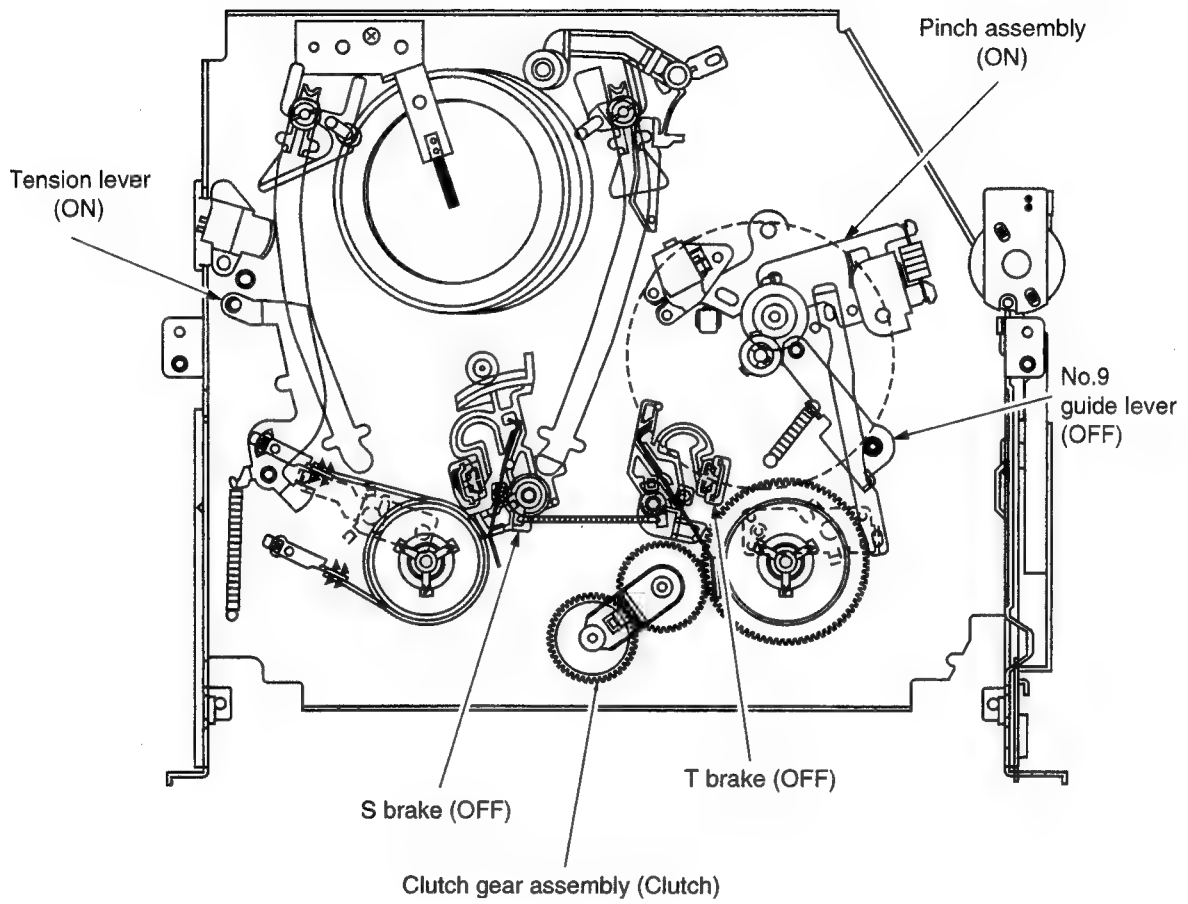
- 1) The pinch roller moves toward the capstan side and press-fits the capstan.
- 2) The No. 9 guide is loaded once and then returned immediately.
- 3) The tension post touches the tape, the band braking force is applied, and the tension servo mechanism works.
- 4) The clutch gear assembly enters clutched condition.
- 5) S, T main brakes are released.

4. IT001 makes the capstan rotate in the forward (X1) direction and feeds the tape. The idle gear transmits the rotation to the T reel table and the reel table takes up the tape at a constant torque by the clutch mechanism.
5. IT001 controls the video circuit and switches the playback screen.
6. The recording speed data identified by IT001 is displayed in the display tube through IK01.



Cassette-in SW works as a REC-inhibiting SW at the shaded part's period.

Fig. 1-6-19 Playback mode



**Fig. 1-6-20 Playback mode (Position IV)**

<Still mode>

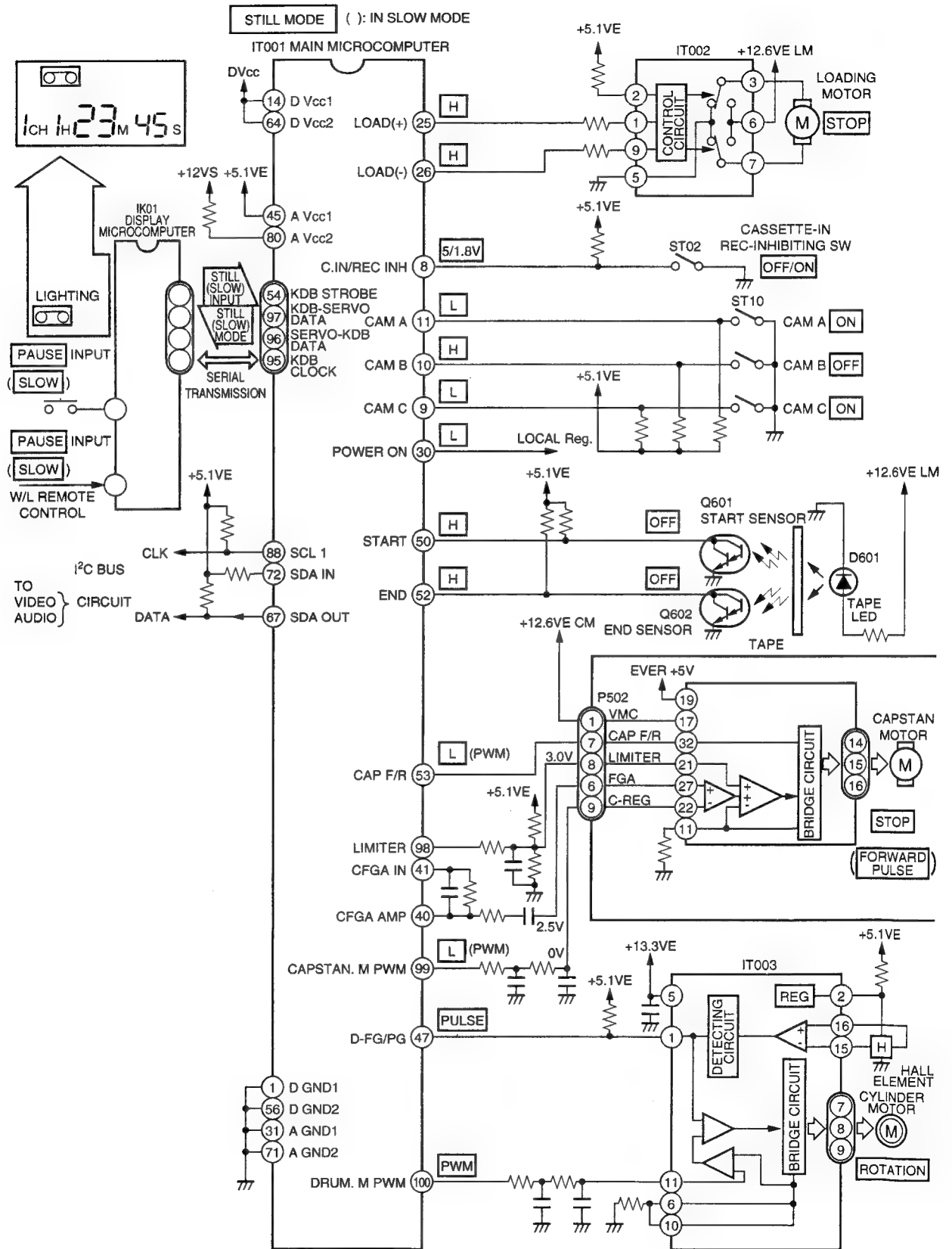


Fig. 1-6-21



1. When the [PAUSE] button is pressed in the playback mode, the mechanism enters the still mode. The cam slider is in the position IV (playback mode), the cylinder motor is rotating, and the capstan motor is rotating in the forward direction.
2. IT001 controls the audio circuit and actuates the audio mute function.
3. The capstan motor enters the intermittent operation mode and then stops.
4. IT001 maintains the recording speed data just before the still operation and sends the data to IK01.
5. In the slow mode, the capstan motor rotates continuously in the intermittent driving.

<CUE mode>

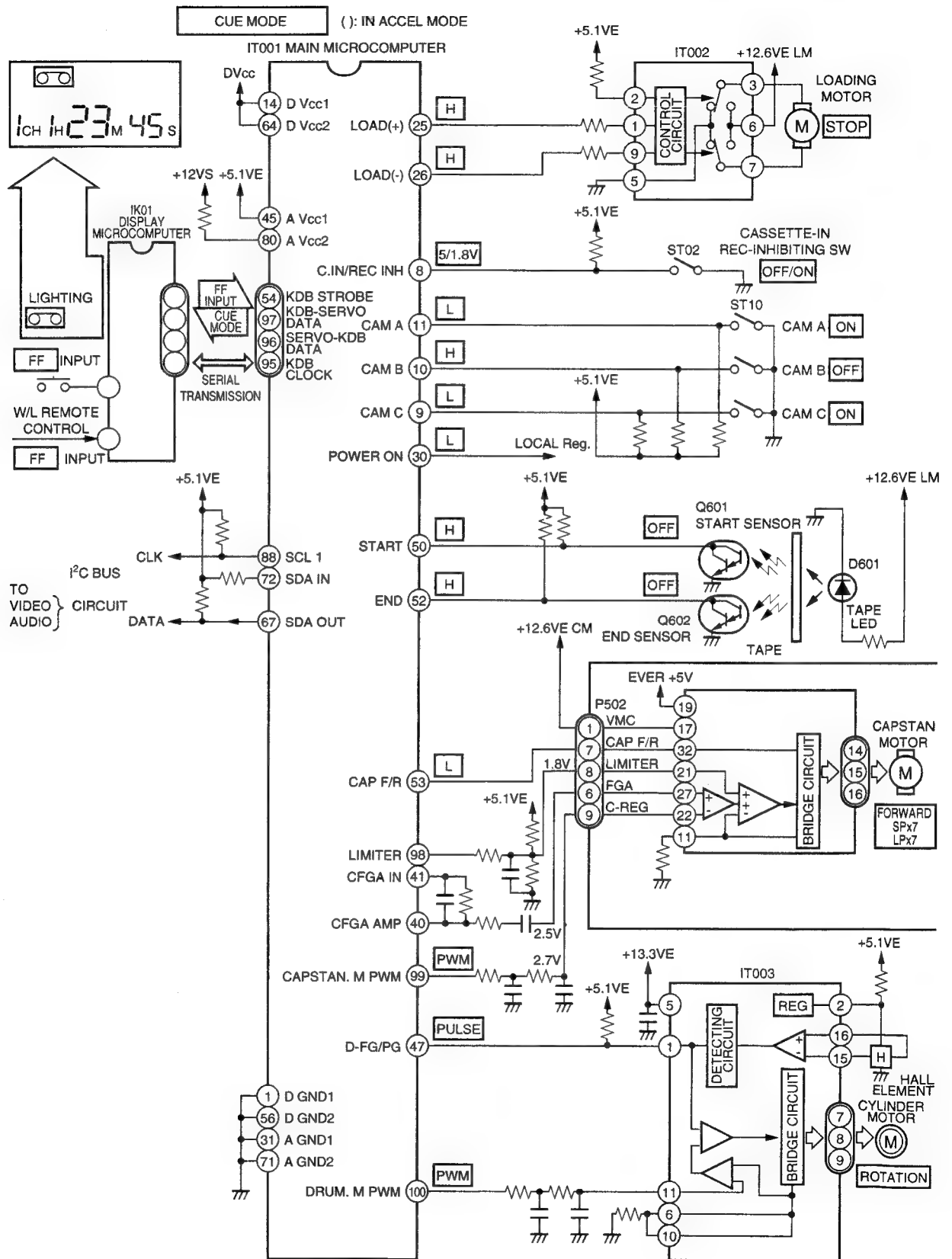


Fig. 1-6-22

1. When the [FF] button is pressed in the playback mode, the mechanism enters the cue mode (fast playback). The cam slider is in the position IV (playback mode), the cylinder motor is rotating, and the capstan motor is rotating in the forward direction.
2. IT001 controls the audio circuit to actuate the audio mute operation.
3. IT001 makes the capstan rotate at 5 times for SP, 15 times for LP to feed the tape, respectively. The tape is taken up at a constant torque by the clutch mechanism. (The mechanical operation is the same as that in the playback mode.)
4. The recording speed data identified by IT001 is displayed on the display tube through IK01.

<Review mode>

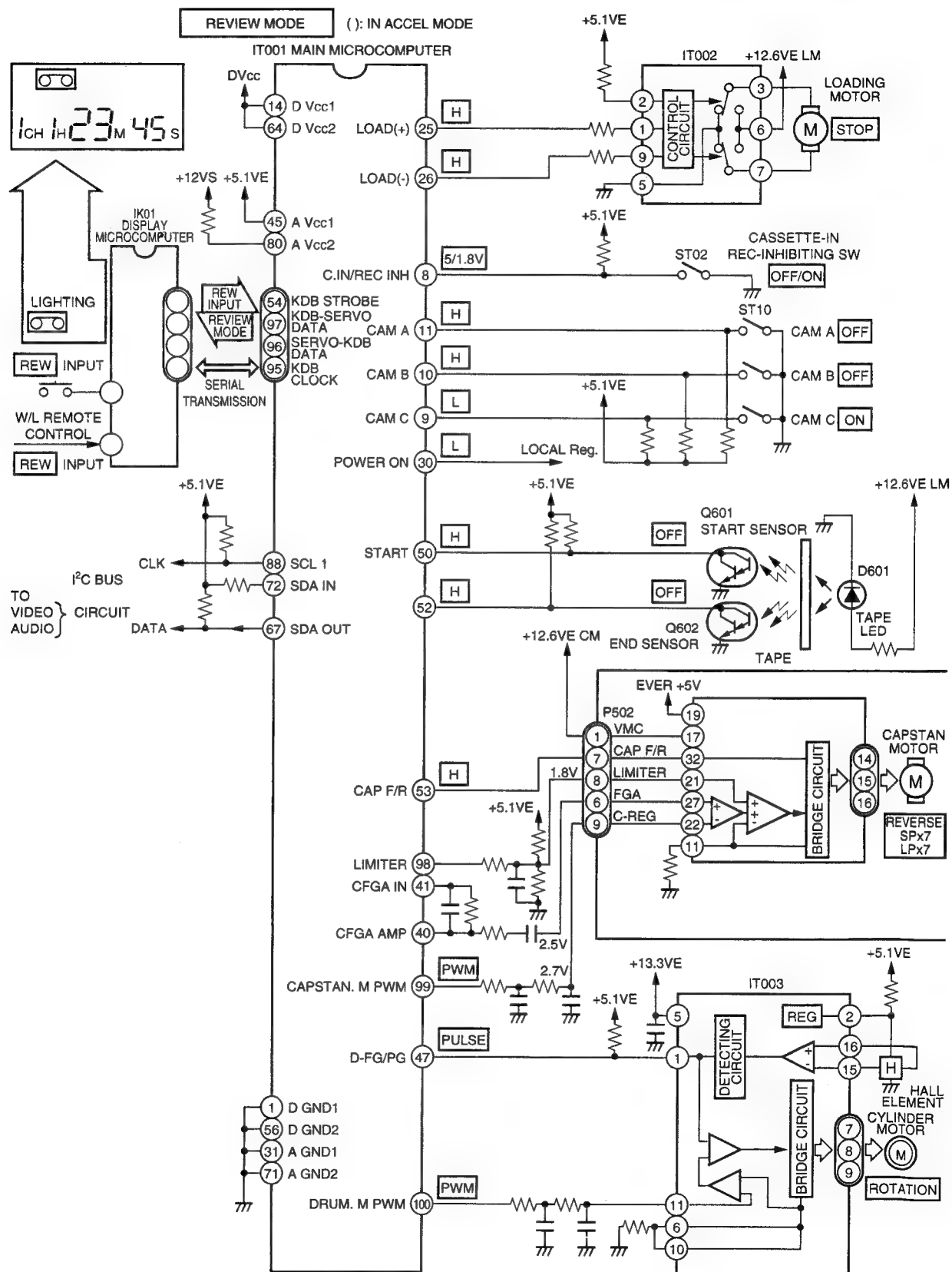


Fig. 1-6-23

1. When the [REW] button is pressed in the playback mode, the mechanism enters the review mode. The cam slider is in the position IV (playback mode), the cylinder motor is rotating, and the capstan motor is rotating in the forward direction.
2. IT001 controls the audio circuit to actuate the audio mute operation.
3. IT001 controls IT002 to make the loading motor rotate in the forward direction. When the cam slider reaches the position V (stop mode), the loading motor stops. During the mode shift operation, the mechanism rotates the capstan motor in the forward direction for a constant time so that the tape is not slackened.
4. When the cam slider reaches the position V, the capstan motor is rotated in the reverse direction for a constant time, and the idle gear is swung toward the S reel table side. Then, the loading motor rotates in reverse direction and shifts to the position III (review mode).

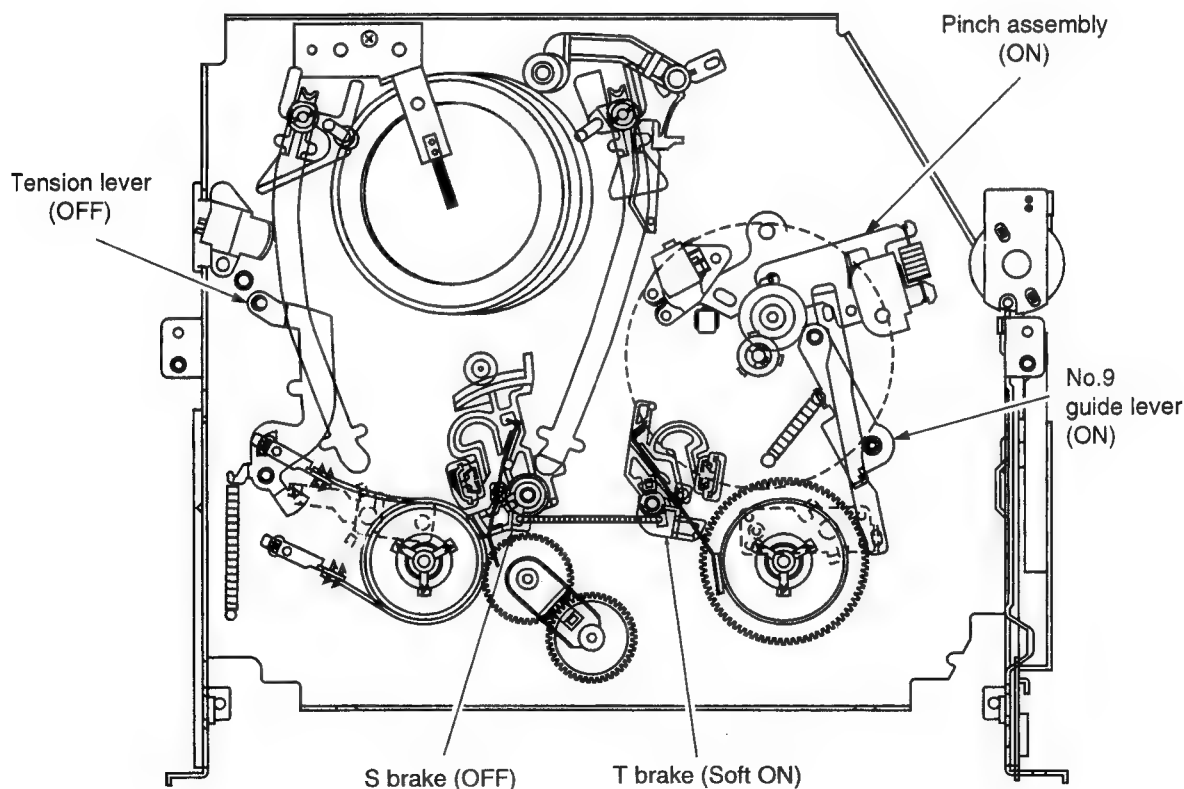
When the cam slider reaches the position III (review mode), the loading motor stops.

The mechanism status is as follows:

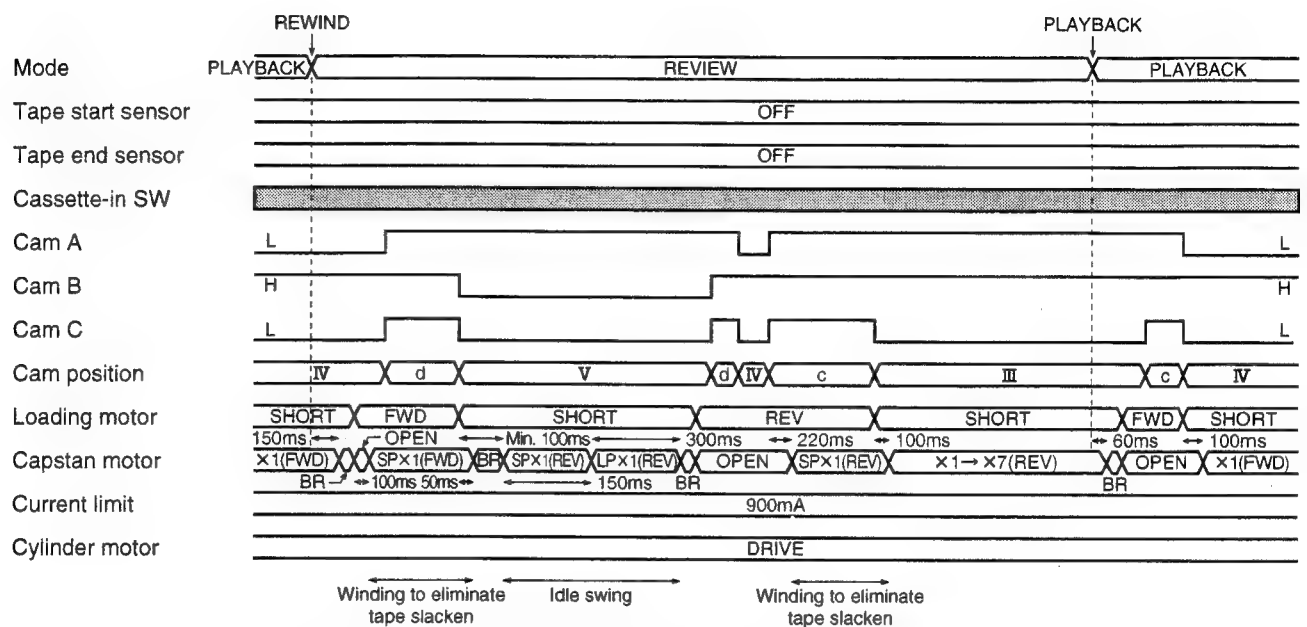
- 1) The No.9 guide is loaded.
- 2) The tension post is separated from the tape.
- 3) The T soft brake is turned on.

The capstan motor rotates in the reverse direction at 5 times for SP, 15 times for LP to feed the tape in the REW direction, respectively. At the same time, the idle gear transmits the rotation to the S reel table and the S reel table takes up the tape by the clutch mechanism.

5. The recording speed data identified by IT001 is displayed on the display tube through IK01.



**Fig. 1-6-24 Review mode (Position III)**



Cassette-in SW works as a REC-inhibiting SW at the shaded part's period.

**Fig. 1-6-25 Review mode**

## (7) REC mode

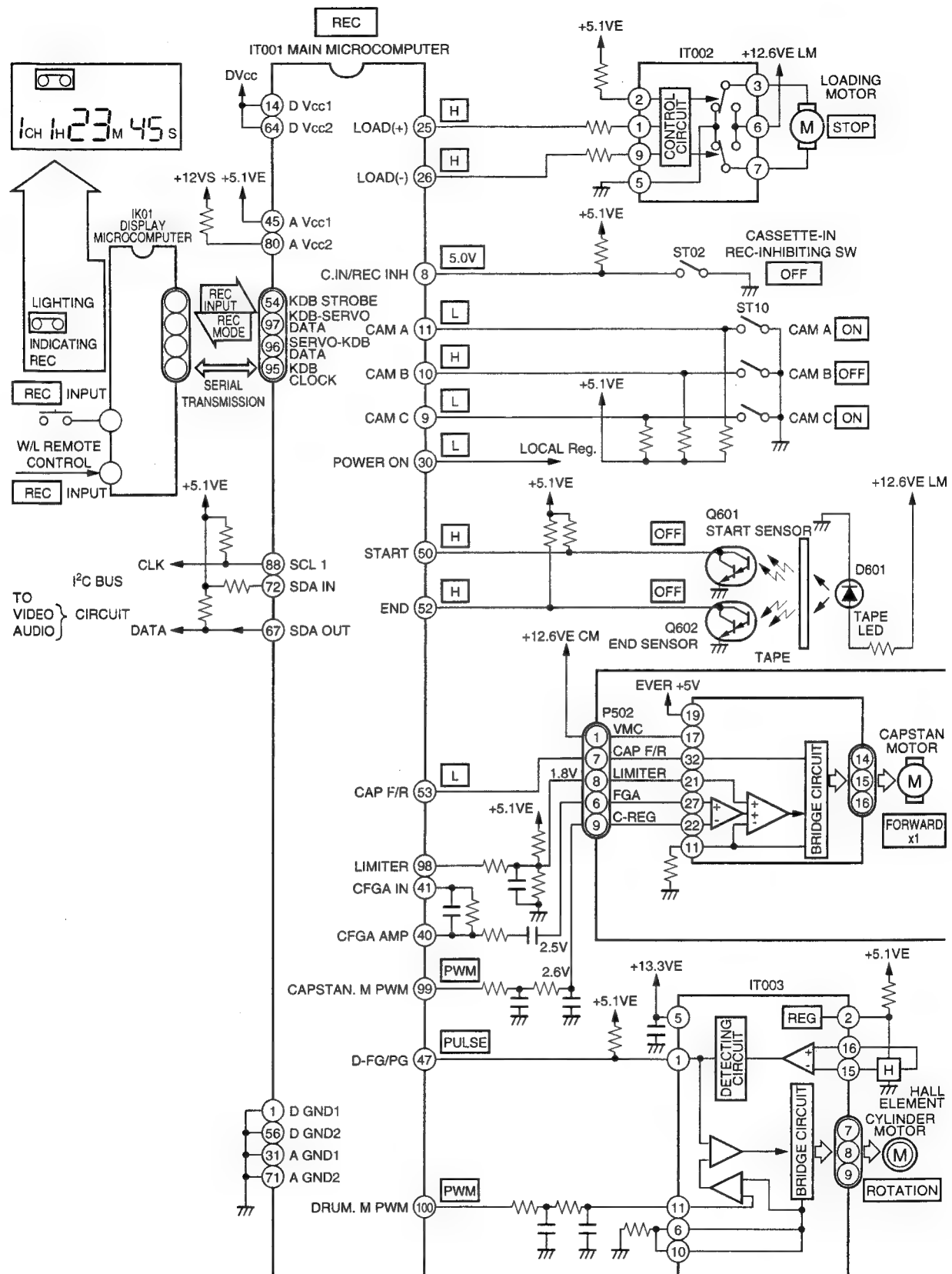


Fig. 1-6-26

### <REC mode>

1. When the [REC] button is pressed in the stop mode, the mechanism enters the REC mode.
2. The cylinder motor starts and then the loading motor rotates in reverse direction. The cam slider reaches the position IV (playback mode). The tape is taken up at a constant torque. The mechanism operations are the same as those in the playback.
3. IT001 controls the audio circuit and video circuit to set the record enable mode.
4. Recording mute is released, thus setting the recording status. The CTL signal is output for recording.

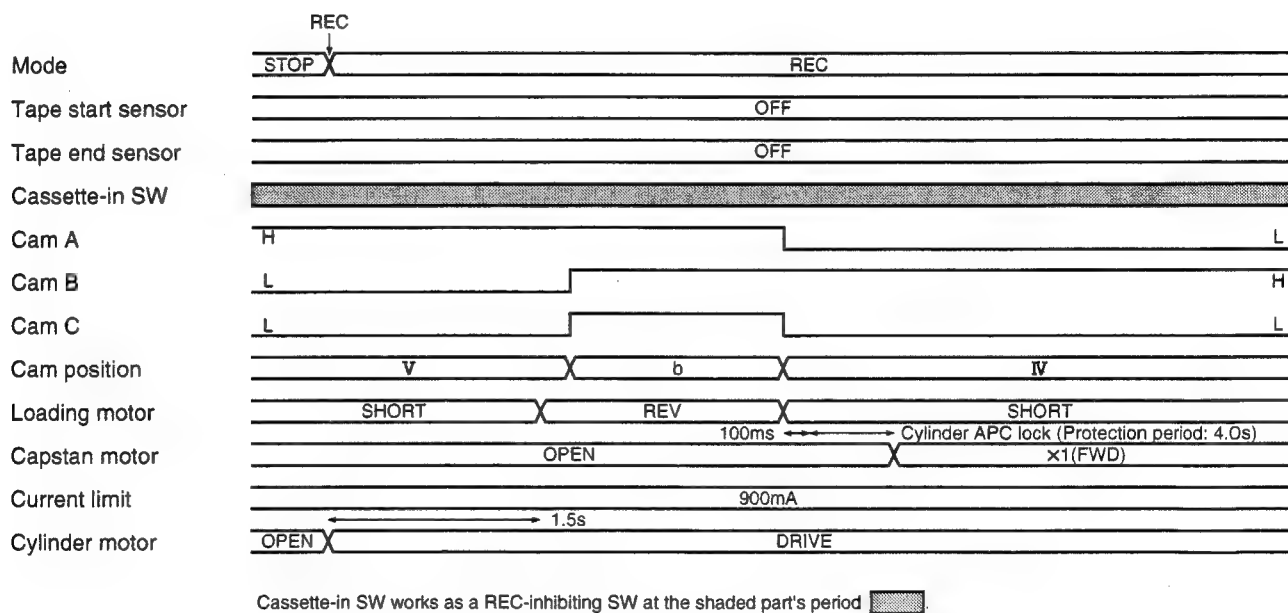


Fig. 1-6-27 REC mode



<REC PAUSE mode>

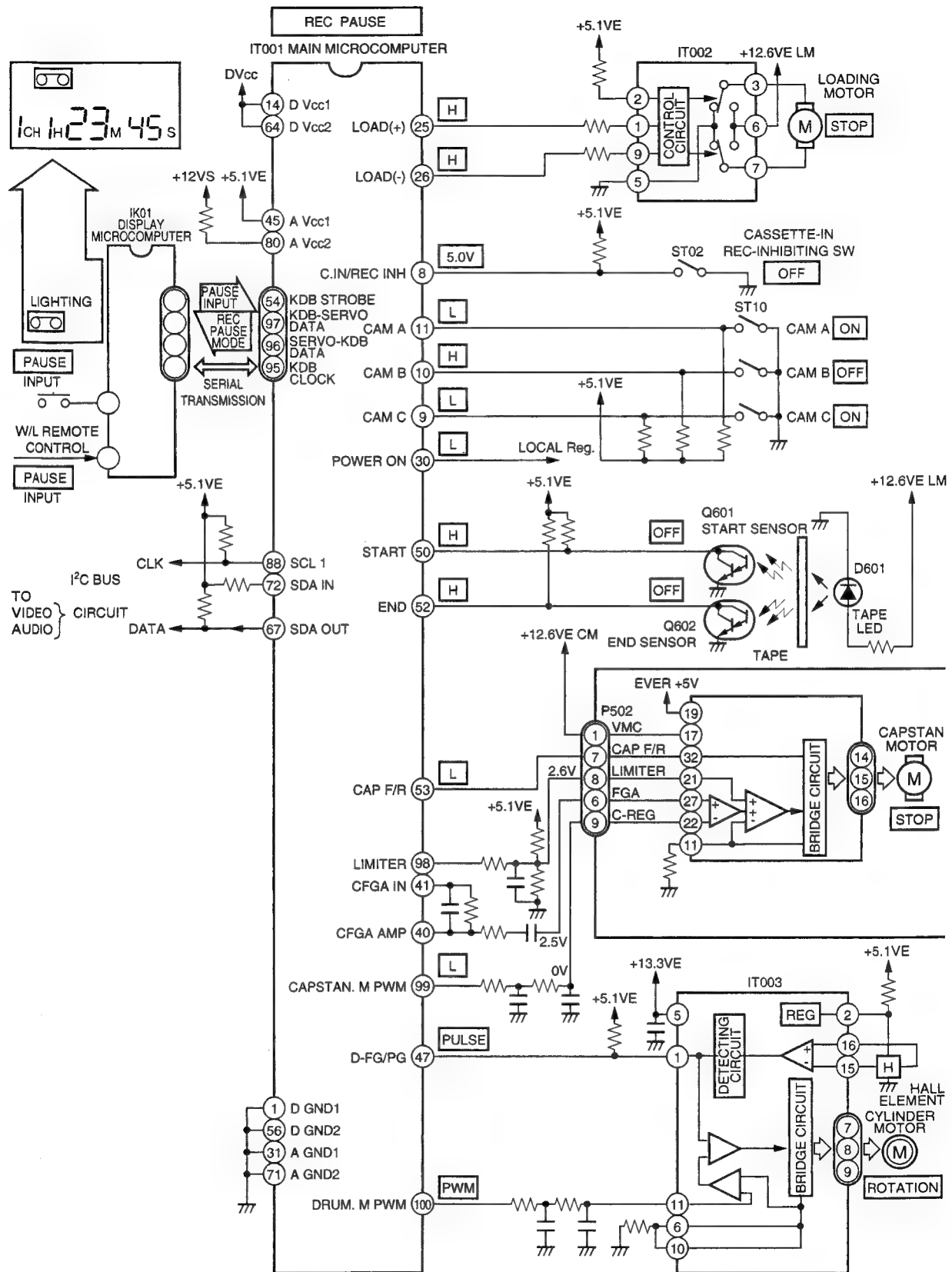


Fig. 1-6-28

1. When the [PAUSE] button is pressed in the REC mode, the mechanism enters the REC pause mode.
2. IT001 controls the audio circuit and the video circuit, and releases the record enable mode and performs the rewinding for synchronous editing.
3. After completion of the rewinding for synchronous editing, the cam slider is in the position IV (playback mode), the cylinder motor is rotating, and the capstan motor and the loading motor stop.

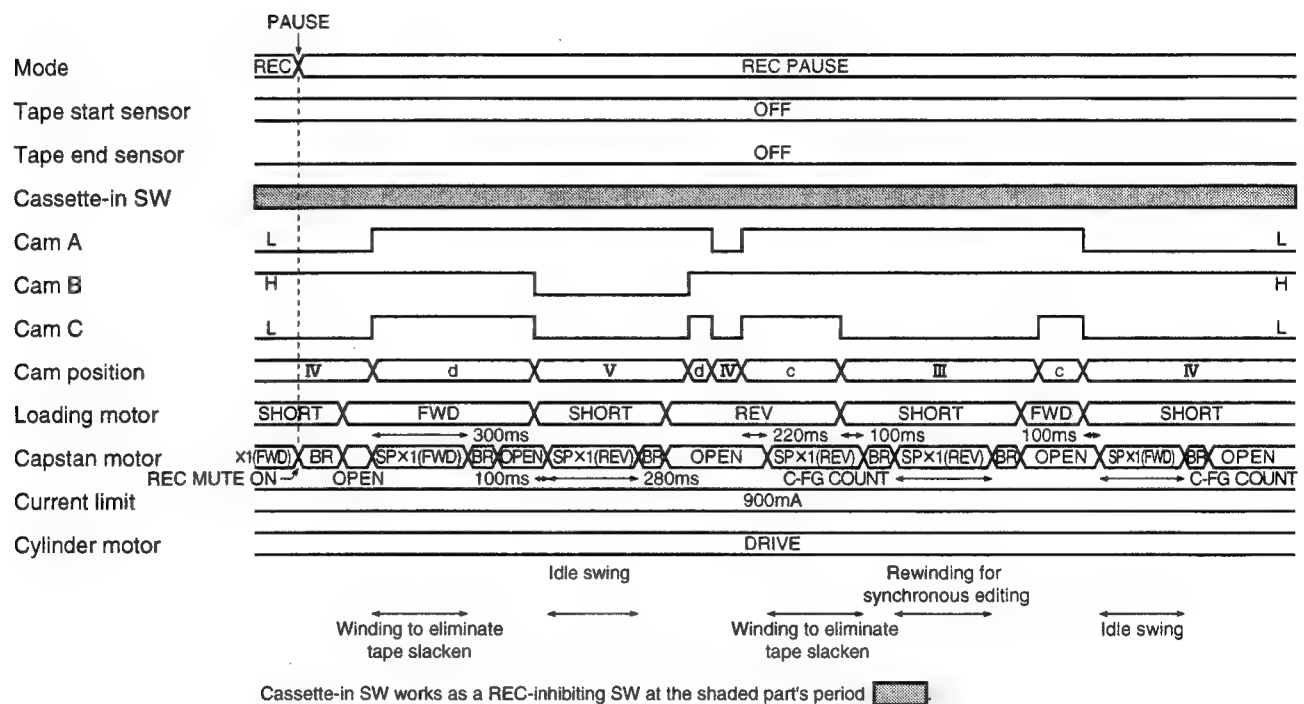


Fig. 1-6-29 REC Pause mode

<Rewind for synchronous editing mode>

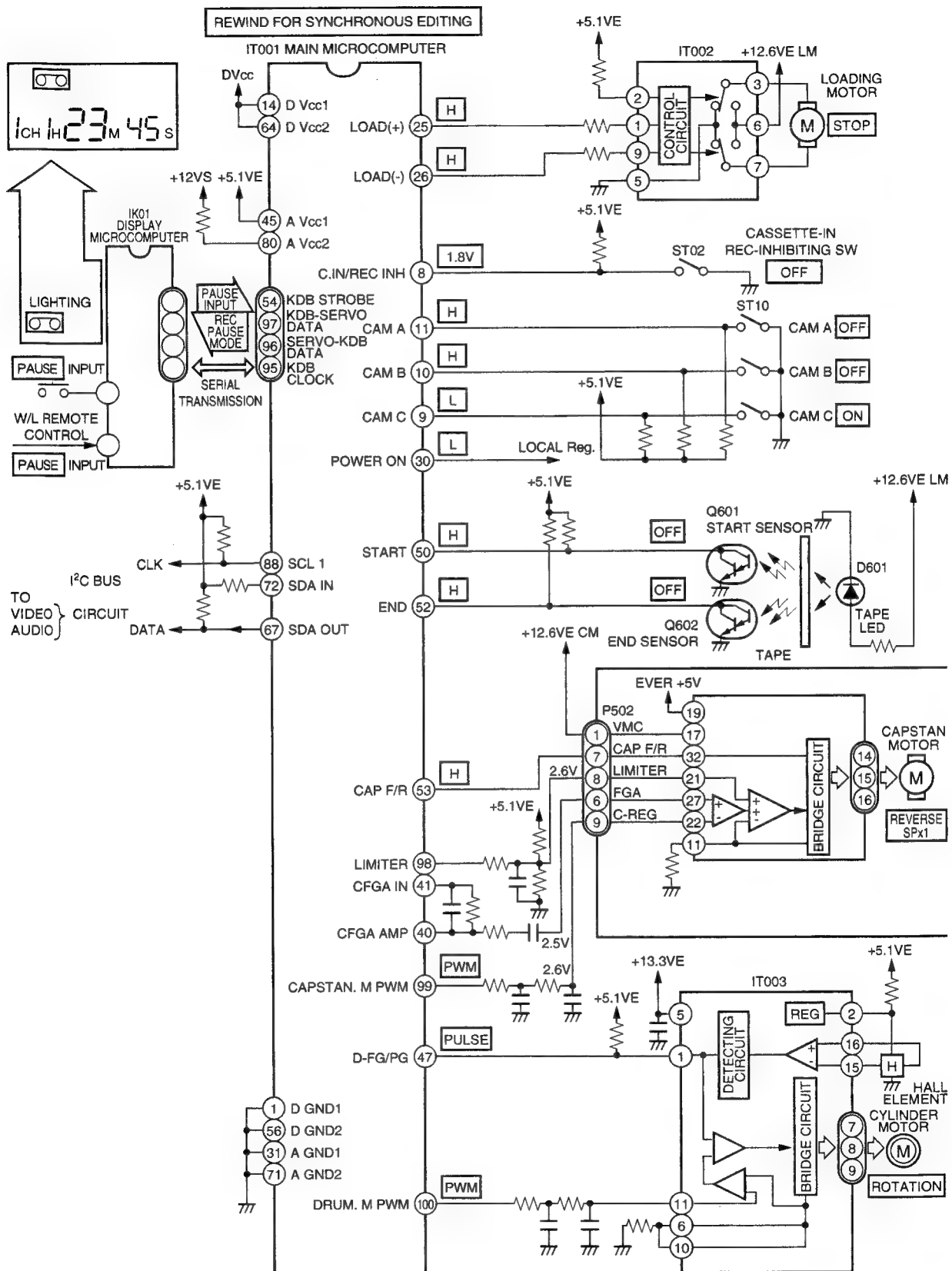


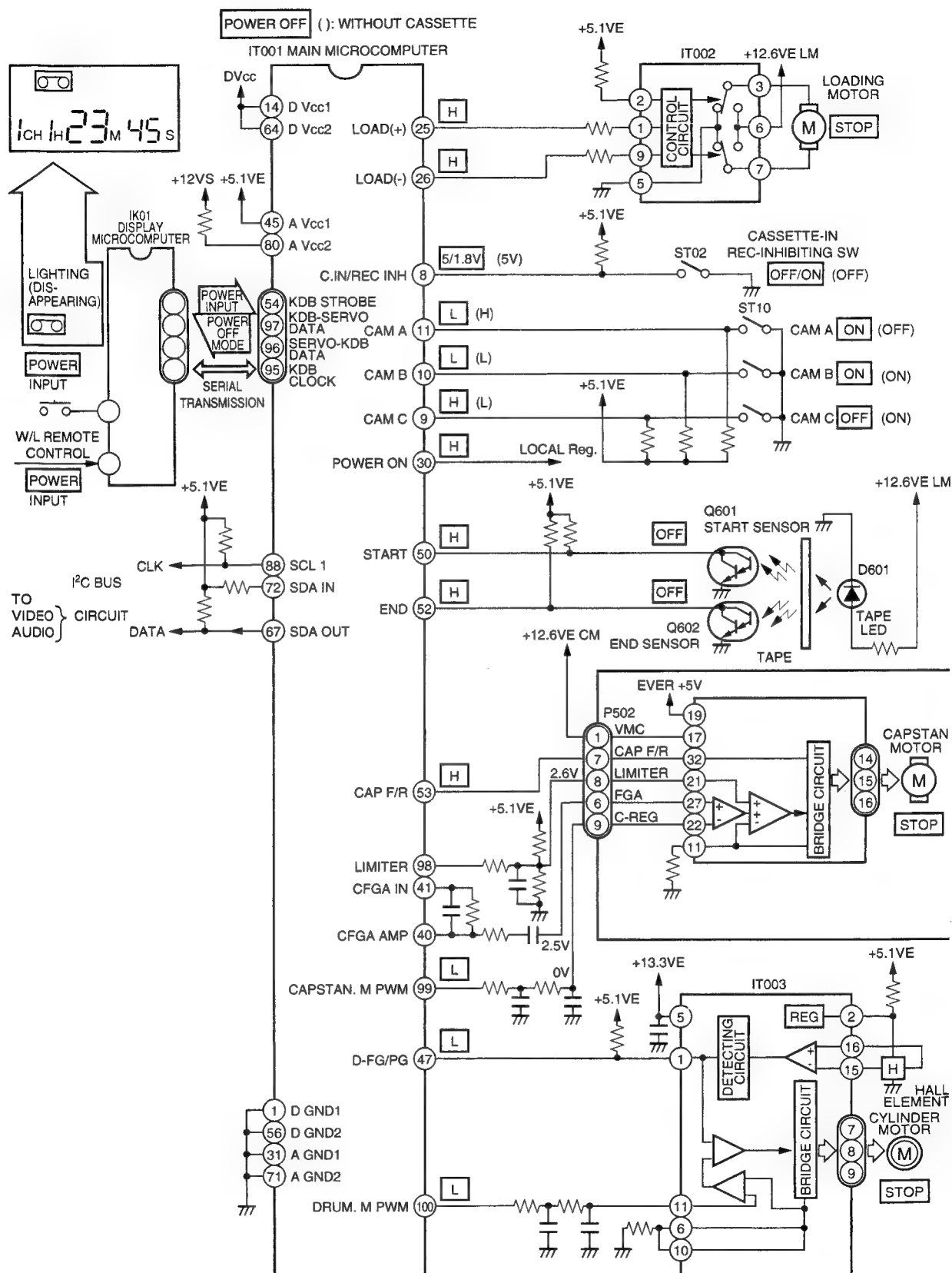
Fig. 1-6-30

1. When the [PAUSE] button is pressed in the REC mode, the mechanism enters the REC Pause mode. The cam slider is in the position IV, the cylinder motor is rotating, and the capstan motor is rotating in the forward direction.
2. IT001 controls the audio circuit and the video circuit to release the recording status.
3. IT001 stops the capstan motor.
4. IT001 controls IT002 to make the loading motor rotate in the forward direction to move the cam slider to the position V (Stop mode). During the mode shift, the capstan motor is rotated in the forward direction for a constant time so that the tape is not slackened.
5. When the cam slider reaches the position V (Stop mode), IT001 makes the capstan motor rotate in the reverse direction for a constant time, and the idle gear is swung toward S reel table. After swinging of the idle gear completes, the loading motor rotates in the reverse direction, and the mode shifts to position III (review mode). When the cam slider reaches the position III (review mode), the loading motor stops.
6. IT001 makes the capstan motor rotate in the reverse direction (SPX1) and feeds the tape in the rewinding direction. At the same time the idle gear transmits rotation to the S reel table and the S reel table takes up the tape by the clutch mechanism. The capstan motor stops after feeding the tape by a specified amount in the rewinding direction.
7. The loading motor rotates in the forward direction and stops when the cam slider reaches the position IV.
8. The capstan motor rotates in the forward direction (SPX1) and feeds the tape. At the same time, the idle gear transmits rotation to the T reel table and the T reel table takes up the tape at a constant torque by the reel clutch mechanism. The capstan motor stops after feeding the tape by a specified amount in forward direction.

#### **(8) Power OFF mode**

1. When the [POWER] button is pressed in the stop mode, IT001 controls the tape unloading, and the mechanism performs the unloading operations.
2. The loading motor rotates in the reverse direction, and IT001 rotates the capstan motor in the reverse direction (SPX3) to take up the tape at a constant torque by the reel clutch mechanism when the cam slider reaches the position II.
3. When the cam slider reaches position I, IT001 applies braking force to the capstan motor to stop, and the loading motor also stops after 200ms after.
4. The capstan motor rotates in the forward direction (SPX1) and feeds the idle gear swung toward the T reel side.
5. The loading motor rotates in the forward direction until position II is detected, and it rotates in the reverse direction up to the Power OFF position of the position I. During the reverse operation, the capstan rotates in the forward direction (LPX1) for a constant time, and releases exceeding braking force concurrently.
6. After audio mute is actuated, IT001 controls the power circuit and turns off the ON/OFF system power.

## <Power OFF mode>



**Fig. 1-6-31**

## 1-7. Self-Check Function

### 1-7-1. Outline

When a tape running stops or the VTR enters the power OFF mode, etc. due to some abnormality, the abnormality is stored in the EEPROM and displayed on the display tube.

### 1-7-2. Storing Abnormal Modes

1. The abnormality is classed into 5 groups, and the abnormality number, system control mode, and the mechanism position at which the abnormality occurred are stored in the EEPROM.
2. The writing timing is just after the abnormality occurred.

### 1-7-3. Abnormality Mode Display

1. Press the CH UP and CH DOWN buttons on the VTR simultaneously for more than 5s.
2. And then within 2s, press the PAUSE button on the remote control.
3. The system control mode at which the abnormality occurred is displayed at the channel display area, "F" is displayed at the hour digit, abnormality generation number is displayed at the minute digit, and the mechanism position is displayed in the second digit position.
4. The abnormality mode is displayed regardless of the power on off.

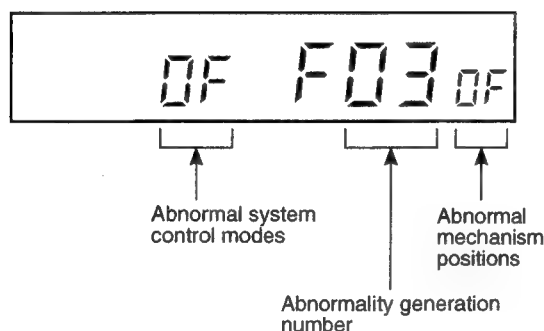


Fig. 1-7-1

5. When the Counter Reset button is pressed in the display period, the abnormality display data is initialized and "-" is displayed.

The data displayed are as follows:

Table 1-7-1 Abnormality generation number

01	Cylinder stop
02	Reel abnormality (take up)
03	Reel abnormality (supply)
04	Abnormal slot in/slot out
05	Abnormal loading

Table 1-7-2 Abnormal system control modes

00	Standby
01	Stop
02	Rewind
03	Review
04	FF
05	Cue
06	Playback
07	Still, slow playback
08	X2 speed
09	Unloading stop
0A	Reverse playback
0b	Still in reverse playback, Reverse slow playback
0C	Recording
0d	Record pause
0E	Power off eject
0F	Eject
10	Short FF
11	Short REW

Table 1-7-3 Abnormal mechanism positions

00	F/L driving
02	Loading/unloading
04	Reverse rotation with pinch roller ON
06	Playback with pinch roller ON
08	Stop with main brake ON
0A	FF/REW
0F	Position detection impossible

Positions 01, 03, 05, 07, and 09 exist as mechanism positions.

For example, 05 shows a position between 04 and 06 (between playback position and review position).

### 1-7-4. Cylinder Rotation Time Display

#### (1) Outline

All the time for which the cylinder is ON is counted, memorized on EEPROM, and indicated on the display tube.

#### (2) Display method

1. Press the "CH UP" and "CH DOWN" button on the main unit for more 5 s at the same time.
2. Next, within 2 s press the "STOP" button on the remote control.
3. The cumulative operation time of the cylinder will be displayed for 30 s. The time unit is an hour.

#### (3) Example of display

1. In case of 1234 hours.

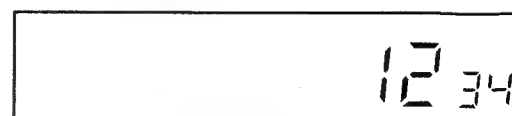


Fig. 1-7-2

2. In case of 4 hours.



Fig. 1-7-3

## 2. MECHANICAL ADJUSTMENT

### 2-1. Mechanical Parts Location

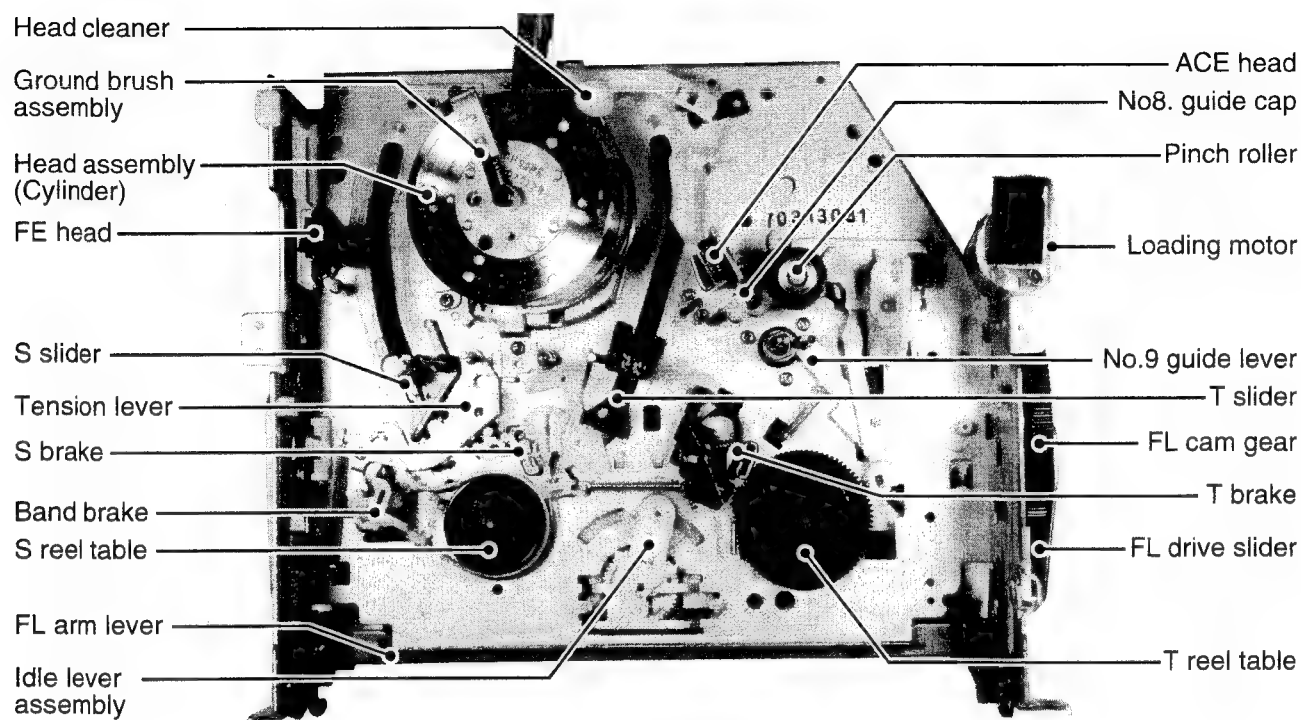


Fig. 2-1-1 Top View-1

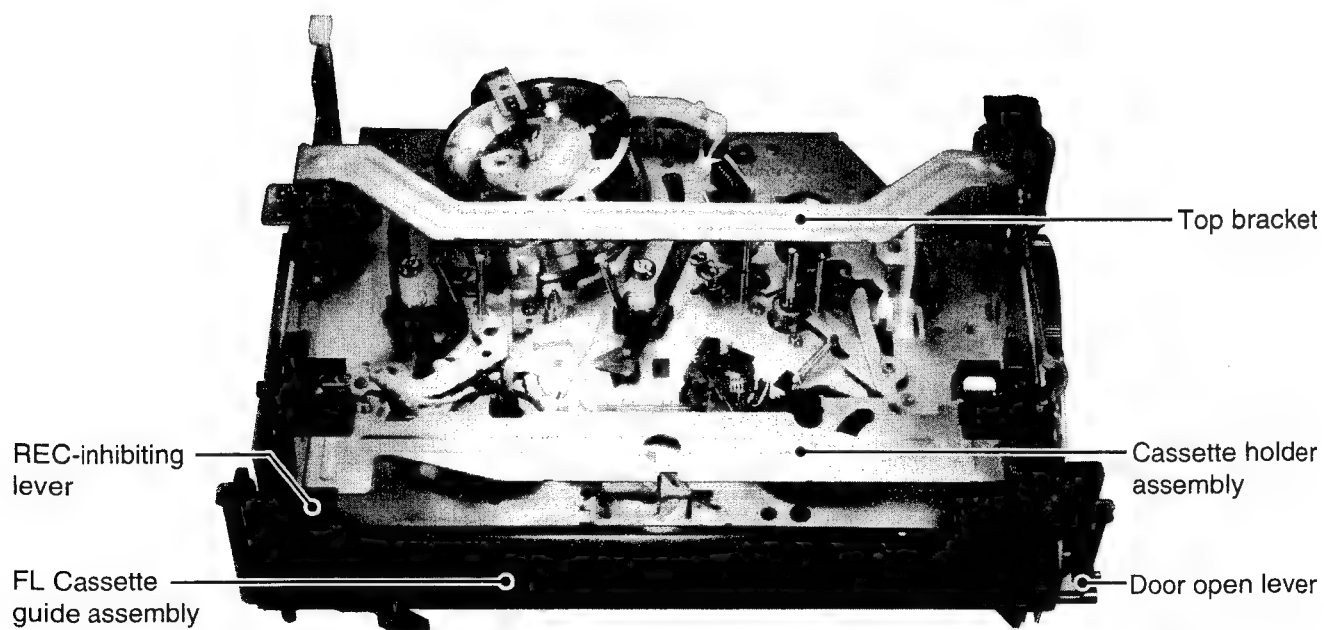


Fig. 2-1-2 Top View-2

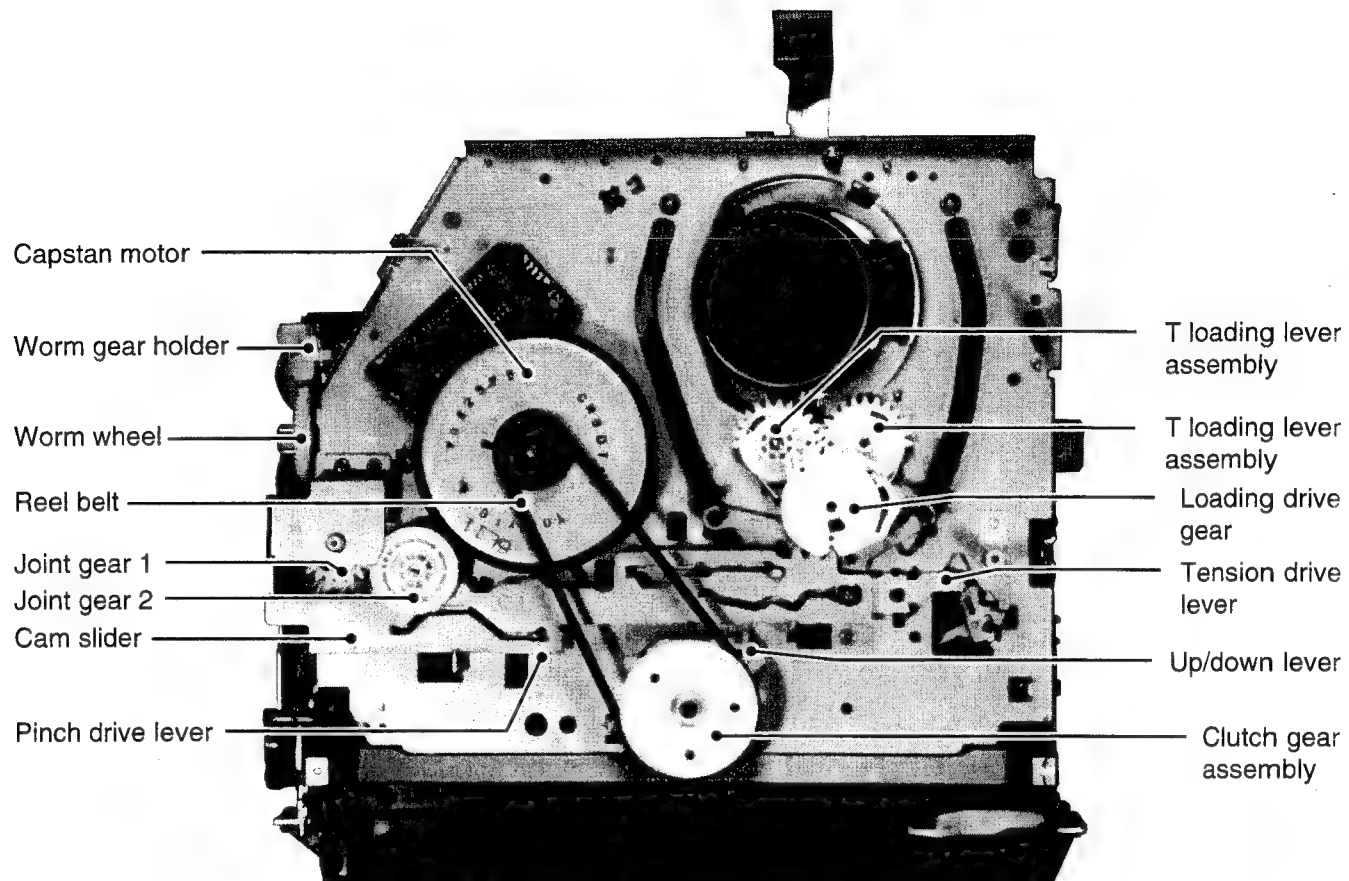
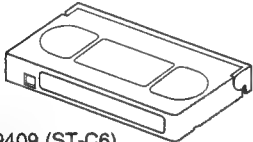
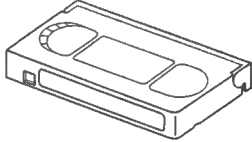
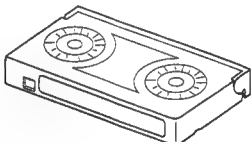
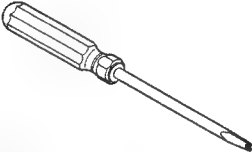
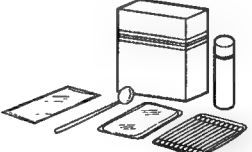




Fig. 2-1-3 Bottom View

## 2-2. Servicing Jig List

Table 2-2-1

<p>① Alignment tape</p>  <p>70909409 (ST-C6) 70909410 (ST-C7)</p>	<p>② Back tension cassette gauge</p>  <p>70909103</p>	<p>③ Torque cassette (KT-300NR)</p>  <p>70909199</p>
<p>④ Taper nut driver</p>  <p>70909228</p>	<p>⑤ VTR cleaning kit</p> 	<p>⑥ VTR lubrication kit</p> 
<p>⑦ Grease</p> 		

**Note:**

Conventional alignment tapes ST-C1 (70909227) and ST-C3 (70909264) can be used partially.



## 2-3. Main Parts Servicing Time

1. Part replacement time differs from servicing life time of each part.
2. Following table is prepared based on a standard condition (room temperature, room humidity). The replacement time will be varied depending upon operation environment, using methods, operation duty.
3. Particularly, life of the head assembly (cylinder) depends upon operation conditions.

Table 2-3-1

	PART NAME	CRITERIA (OPERATING HOURS)										NOTE
		500	1000	1500	2000	2500	3000	3500	4000	4500	5000	
Tape Transport System	Tension post											<ul style="list-style-type: none"> <li>• When cleaning, use a swab or piece of gauze soaked in alcohol.</li> <li>• After cleaning, cleaned parts are dried completely, and then load a video cassette.</li> <li>• When lubricating, always use the specified oil.</li> <li>• When the lubricating, apply one or two drops of oil after the cleaning with alcohol.</li> </ul>
	S/T slant guide post											
	No. 8 guide post	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	
	Capstan											
	No. 9 guide post											
	No. 3 guide post											
	S/T guide roller	Δ	Δ	Δ	○	○	○	○	○	○	○	
	Head assembly (cylinder)	Δ	○	○	○	○	○	○	○	○	○	
	FE head	Δ	Δ	Δ	○	○	○	○	○	○	○	
	ACE head	Δ	○	○	○	○	○	○	○	○	○	
	Pinch roller	Δ	○	○	○	○	○	○	○	○	○	
Tape Drive System	Capstan motor	Δ	Δ	Δ	Δ	Δ	○	○	○	○	○	
	Loading motor				○	○	○	○	○	○	○	
	Reel belt	Δ	○	○	○	○	○	○	○	○	○	
	Clutch gear assembly		○	○	○	○	○	○	○	○	○	
	Idle lever assembly		○	○	○	○	○	○	○	○	○	
Others	Band brake		○	○	○	○	○	○	○	○	○	
	Ground brush assembly		○	○	○	○	○	○	○	○	○	

Δ : Cleaning, ○ : Check and replace if necessary.

## 2-4. Mechanism Check Method

If the abnormal condition is caused by the mechanism itself, analyze the cause according to the following procedures.

### 2-4-1. External Appearance Check

1. Check whether there are foreign matters or not inside the VTR.
2. Check whether the cylinder and the guides for tape transport system are contaminated.

### 2-4-2. Motor and Sensor System Check

Check whether some abnormalities are found in the motor or the sensor system (including control circuits) according to the flow chart.

### 2-4-3. Abnormality Analysis by Self-check Function

The unit used New V mechanism has a self-check function. The self-check function works as a system which stored some abnormal condition. So, use this function to try to analyze the cause(s).

For the data display method and the content of the data, refer to the self-check function (described on page 1-44) in item 1-7.

#### Note:

- Abnormal data is displayed only when the first abnormal condition occurs, and is not displayed in the second time. Accordingly, the claim from customers and the actual data displayed may be different.
- The data is stored only when the power turns off after occurring the abnormality condition(s). The data is not stored when the unit operation is recovered by the microcomputer.
- After repairing, initialize the data by pressing the [COUNTER RESET] button while displaying the abnormal mode.

The typical examples in abnormal condition are shown below.

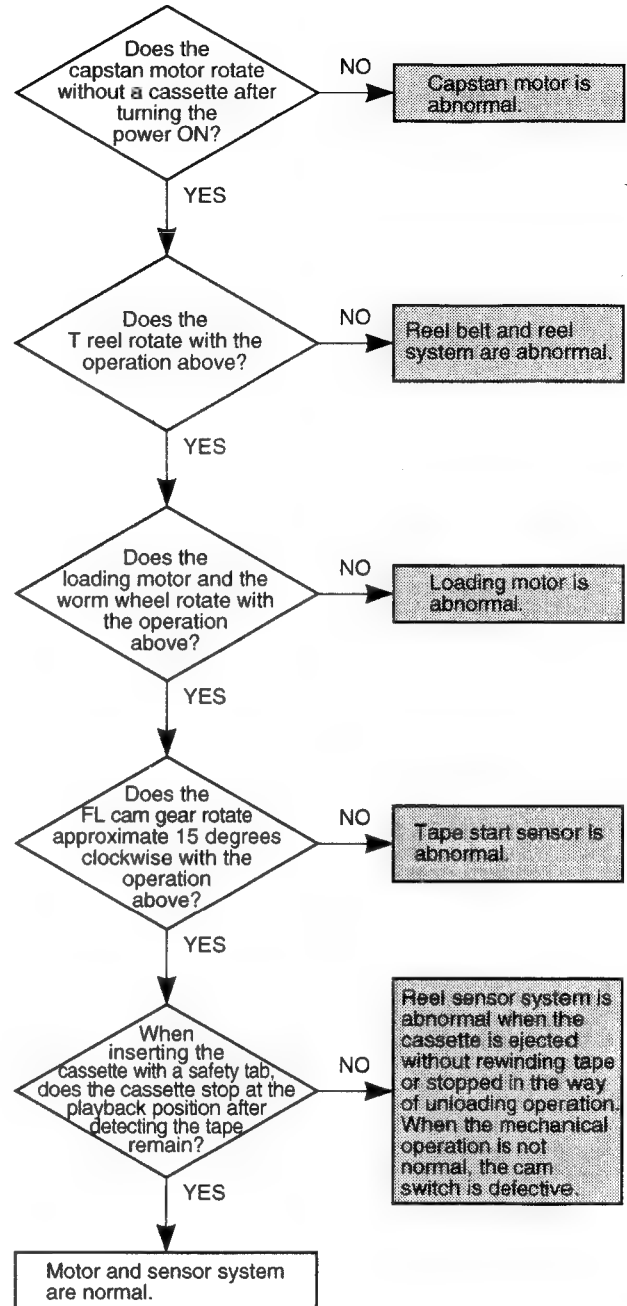


Fig. 2-4-1

Table 2-4-1

A	B	C	ABNORMAL CONDITION	CHECK ITEM
06	01	06	Cylinder is stopped at playback position during playback the tape.	} Check the cylinder motor. Check if the cylinder and tape transport guide are clogged.
02	01	08	Cylinder is stopped at FF/REW position during rewind the tape.	
06	02	06	T reel sensor is abnormal at playback position during playback the tape.	} Check the capstan motor. Refer to the cases 2 and 3 described on the table "Defective analyzing table".
03	03	04	S reel sensor is abnormal at review position during REVIEW the tape.	
01	04	00	Cassette-in and out operation cannot be performed.	} Refer to the case 1 described on the table "Defective analyzing table".
03	05	05	Mode shift cannot be performed during shifting to REVIEW.	

A: System control mode, B: Abnormality No., C: Mechanical position when an abnormality occurs.

#### 2-4-4. Check by Defective Analyzing Table

If the abnormality causes the mechanism abnormal condition, presume, confirm and treat the defective according to the Defective analyzing table.

##### (1) Manual mechanism operation (mode shift) method

Remove the worm gear holder with tweezers as shown in Fig. 2-4-2, and remove the worm gear.

The mode of loading direction can be shifted by turning the worm wheel clockwise while pushing in the lock lever R and L of cassette holder manually. At this time, the mechanism condition is set to each position when the  $\Delta$  mark of FL drive slider and the  $\Delta$  mark of FL cam gear fit as shown in Fig. 2-4-3.

 I	Power off	 S	Stop
 R	Review	 FF	FF/REW
 P	Playback		

Check the mechanism condition at the position the defective occurs.

##### Note :

When operating after removing the cassette holder, press down the tension drive lever as shown in Fig. 2-4-4 until the T slider comes AC head position since the S/T sliders start moving.

##### (2) Defective parts replacement

When a defective occurs due to the defective part (s) and the part (s) is replaced, take care the following items.

1. Especially as for the mechanical parts requiring the phase alignment, take care of the part replacement E.g., Assembling mode, phase alignment mark and etc.
2. As for the part (s) requiring lubricant such as a specified amount of oil or grease, apply grease or oil according to the instructions and do not stick grease or oil to the portions without allowing to stick it (especially in removal and assembly).

##### (3) Check after treating the defective

After treating the defective unit (especially replacing a defective part and/or aligning a part), first check the mechanism operation manually and confirm that no problem occurs, and then mount the mechanical deck on the VTR, turn the power ON and check the mechanism operation.

##### Note:

After replacing the defective parts according to the procedure of the treatment method for the damage and phase mismatch of mechanical part, check the operation of the mechanism again, since the same (or similar) defective problem may occur due to other serious cause (in mechanism or electrical circuit) when performing the actual total check with turning the power on.

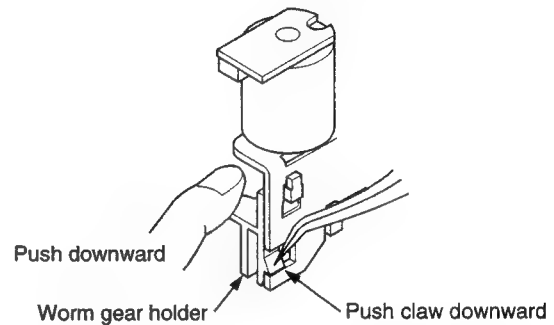


Fig. 2-4-2

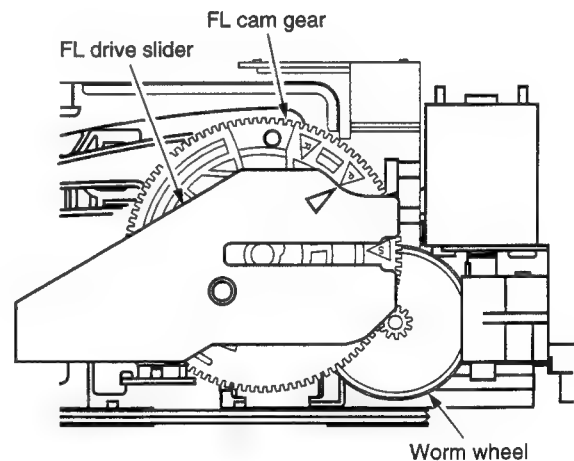


Fig. 2-4-3 Position Mark (Playback position)

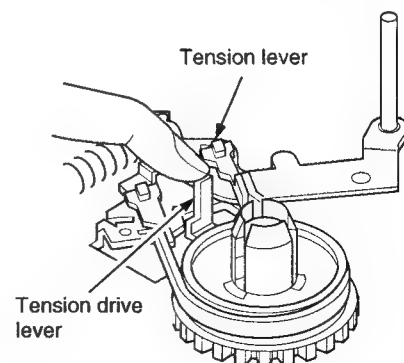


Fig. 2-4-4

**Table 2-4-2 Defective Analyzing Table**

CASE	DEFECTIVE PHENOMENON (MAIN ITEMS)	PRESUMED CAUSE (MAIN CAUSE)	CHECK METHOD
1	Power does not turn on. Loading operation is defective. Mode shift operation is defective.	<General> (1) Mechanism stops due to mechanical phase mismatching.	(1) Check the mode shift "Cassette out FF/REW position" can be performed when turning worm wheel.
	Loading operation is not performed.	(2) Loading motor does not rotate. (Part is defective. * Circuit is defective.)	(2) Check loading motor whether it turns by the outer power supply (12.5V) correctly.
	Unloading operation is not performed.	(3) S reel does not wind the tape.	(3) Refer to case 3 in this table.
2	Playback operation is not performed. Playback operation is defective.	<General> (1) Main brake is not released. (ON) (2) T soft brake is not released. (ON) (3) Idler does not swing. (4) Pinch does not press.	Check mechanical position shown in Fig. 1-6-20.
	Playback picture does not appear. Video recording can not be performed.	(5) Capstan motor does not rotate. (Capstan motor is defective. * Circuit is defective.)	(5) Check capstan motor.
		<In case of no mechanical problem> (6) Cylinder is defective. (* Circuit is defective.)	(6) Check cylinder assembly.
3	Playback interruption. Defective phenomenon during playback. Recording interruption.	(1) Reel rotation detection is defective. (Sensor is defective. * Circuit is defective.)	(1) Check sensor output.
		(2) Idler does not swing.	(2) Check the mechanical position shown in Fig. 1-6-20.
		(3) Reel belt is removed.	(3) Check the reel belt is removed or not.
4	FF operation is not performed. FF operation is defective. REW operation is not performed. REW operation is defective. Other: REV/FF operation is not performed. Other: REV/FF operation is defective.	(1) Main brake is not released. (ON) (2) T soft brake is not released. (ON) (3) Idler does not swing. (4) Pinch is not released.	Check mechanical position for the causes (1) – (4) shown in Fig. 1-6-17.
		(5) Capstan motor does not rotate. (Capstan motor is defective. * Circuit is defective.)	(1) Check capstan motor.
5	REVIEW is not performed.	(1) Main brake is not released. (ON) (2) T soft brake is not actuated. (3) Idler does not turn. (4) Pinch does not press.	Check mechanical position for the causes (1) – (4) shown in Fig. 1-6-24.
		(5) Capstan motor does not rotate. (Capstan motor is defective. * Circuit is defective.)	(1) Check capstan motor.
6	Slot-in is not performed. Cassette can not be inserted.	<General> (1) When the F/L is mounted on the mechanical deck, the position is not correct. (2) Tape start sensor is defective. (3) Cassette in switch is defective.	(1) Check mechanical position shown in Fig. 1-6-6. (2) Refer to 2-4 Mechanism Check Method. (3) Check the switch.
7	Capstan servo does not work. Capstan servo is uneven. Tape speed is fast. Tape speed is slow. Tape speed is uneven. FG pulse is not output.	(1) Capstan motor is defective.	(1) Check capstan motor.
		(2) ACE head control output is defective. (* Circuit is defective.)	(1) Check ACE head. Check CTL output.
8	Audio output does not come out. Audio output is small. Audio output variation is large. Audio output is uneven. Audio distortion. Audio noise. Other: Audio is defective.	(1) ACE head is defective.	(1) Check ACE head. Check CTL output.
		(2) Tape transport adjustment is defective.	(2) Perform tape transport adjustment again after confirming tape transport condition.
		(3) Hi-Fi head (cylinder) is defective. (* Circuit is defective.)	(3) Check cylinder. Check whether B+14V is supplied.

**Treatment :**

If the mechanism is found out to be defective according to the procedures described above, perform the following treatment.

- Misassembling, mechanical phase mismatch ..... Repair correctly.
- Parts defect, parts damage ..... Replace parts.

If the mechanism is found out not to be defective according to the procedures above, check the circuit(s).

#### 2-4-5. Unloading Method of Cassette in Manual

The mechanical deck can not be removed at the condition the cassette is loaded, since one of screws for mounting the mechanism deck with the chassis is located under the cassette.

If the cassette can not be unloaded even pressing the [EJECT] button, eject it using the following method.

1. Remove the worm gear holder and the worm gear, and turn the worm wheel to unloading direction shown in Fig. 2-4-5 with a screw driver etc. (Refer to Item 2-6-7).

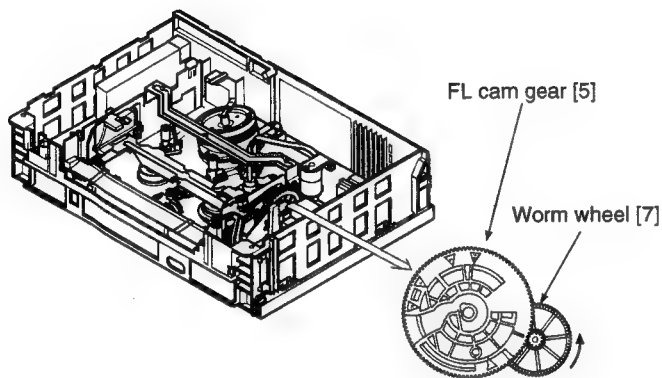


Fig. 2-4-5

#### 2-4-6. Check Method of Each Operation Mode without Loading the Cassette

1. Put some tapes on both left and right side of the cassette holder so that the start/end sensors are not affected by the light. (Fig. 2-4-6)
2. Remove the top bracket.

##### Note:

When releasing the lock lever and slotting in, be sure to remove the top bracket since your finger may be put between the top bracket and the pressure spring of cassette holder.

3. Release both lock levers of the cassette holder and slot it in.
4. Turn the reel table of rotating side and opposite side reel table in manual.
5. In this condition, the operating in each mode can be performed.

##### Note:

In PLAY or FF/REW mode, the auto eject will be actuated or the power will be turned off if the reel pulse, which is generated by turning the rotating side and opposite side reel tables, is not sent manually.

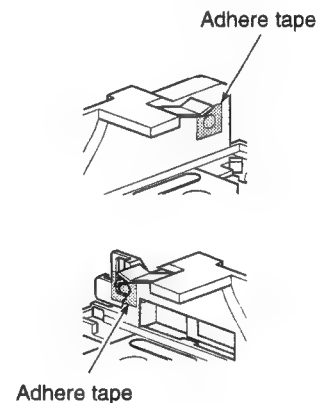


Fig. 2-4-6

## 2-5. Mechanical Deck Removing and Mounting Method

### 2-5-1. Mechanical Deck Removal

1. Remove the power cord [1] from the chassis.
2. Remove the top cover.
3. To remove the front panel, unhook six hooks securing the front panel (two bottom sides and two each on side).
4. Move the cassette holder [4] backward by pressing the lock lever [3] located at both side of the cassette holder, and remove three securing screws [5] on the main base of the mechanical deck.
5. Remove the processed wires [A] connected between the mechanical deck and the main unit, and FPC [B], FFC [C].
6. Remove the mechanical deck lifting it upward.

#### Note:

Don't hold the top bracket [2] when removing the mechanical deck, otherwise the top bracket may be deformed.

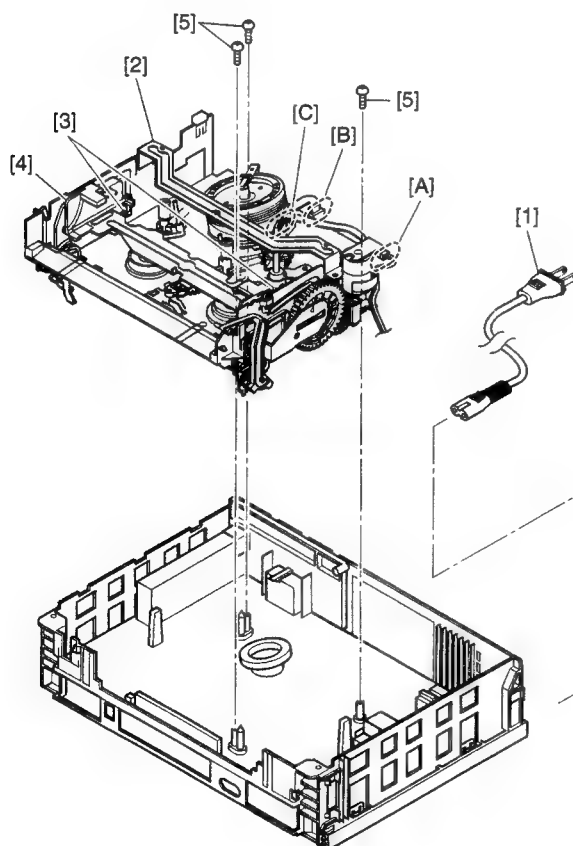


Fig. 2-5-1

### 2-5-2. Mechanical Deck Mounting

1. Align the mark position on the cam switch [1] of the main unit.

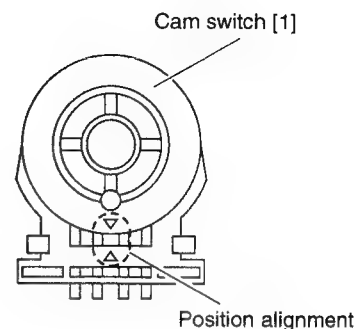


Fig. 2-5-2

2. Keep the mechanical deck in the condition the cassette holder just out.
3. Mount the mechanical deck in the reverse order of removal.

#### Note:

- Pay attention not to damage the rotor of the cylinder and the stator of the main unit etc.
- Correct a dip of the processed wire properly according to the wiring specification.

## 2-6. Main Parts Replacement

### 2-6-1. Top Bracket Replacement

1. Remove two securing screws [2] on both left and right of the top bracket, and remove the top bracket [1].

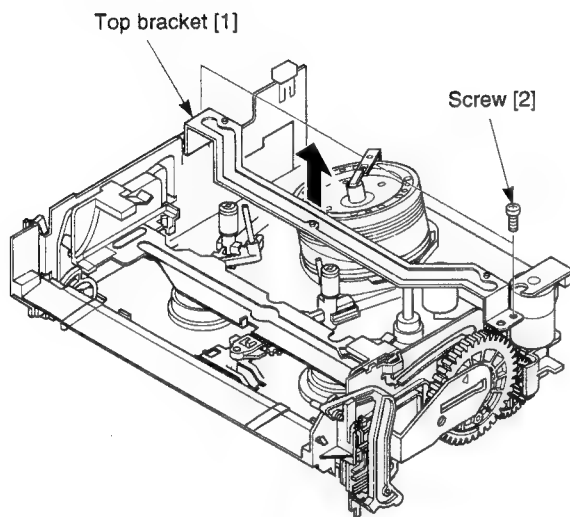


Fig. 2-6-1

2. Replace the top bracket with new one.
3. When mounting the top bracket [1], take care to the direction, and mount it so that the excessive bent portion of the top bracket is faced front.

### 2-6-2. Door Open Lever Replacement

1. Release the claw [A] of the door open lever inserted to the hole at the left lower of the right side mechanical deck, and remove the door open lever [1] while lifting it up from the shaft [B] and the guide portion [C] for the door open lever.

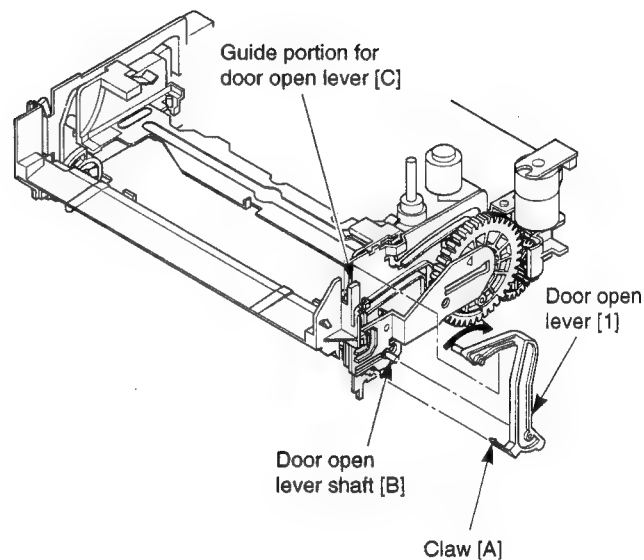


Fig. 2-6-2

2. Replace the door open lever in the reverse order of removal.

#### **Note:**

Mount the door open lever so that it is inserted to the guide portion [C] inside.

### 2-6-3. FL Cassette Guide Assembly Replacement

1. Remove the door open lever. (Refer to Item 2-6-2.)
2. Remove the top bracket. (Refer to Item 2-6-1.)
3. Unlock the lock lever [A] by pressing the arrow "a" on both side of the cassette holder assembly, and move the cassette holder assembly [1] until the vertical slide position of the cassette holder guide groove [C].

#### Note:

Turn the worm wheel clockwise if it is difficult to move it.

4. Remove the FL cassette guide assembly [2] lifting it up while pressing the claw [B] on both sides of the FL cassette guide assembly inside.

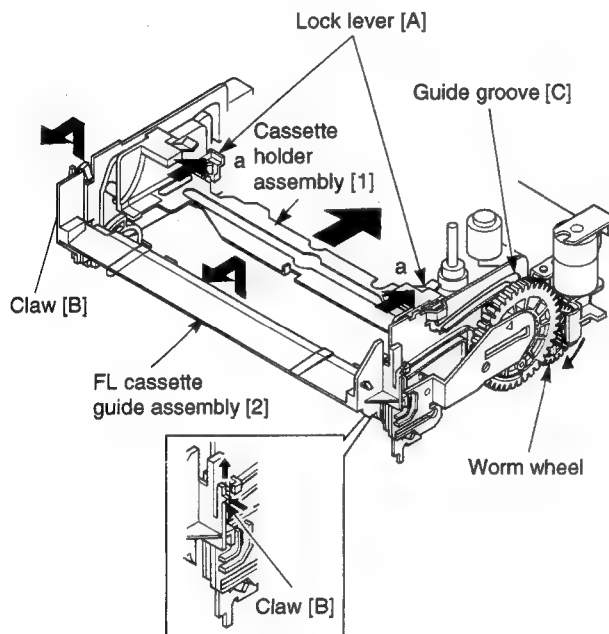


Fig. 2-6-3

5. Replace the FL cassette guide assembly with new one.
6. Mount it in the reverse order of removal.

### 2-6-4. Cassette Holder Assembly Replacement

1. Remove the door open lever. (Refer to Item 2-6-2.)
2. Remove the FL cassette guide. (Refer to Item 2-6-3.)
3. Move the cassette holder assembly [1] this side.
4. Pull the right side of the cassette holder assembly [1] this side so that two bosses [A] and [B] come off from the grooves [C] and [D] of the mechanical deck, and remove the cassette holder assembly [1] from the right side by lifting slantwise while releasing the lock lever.

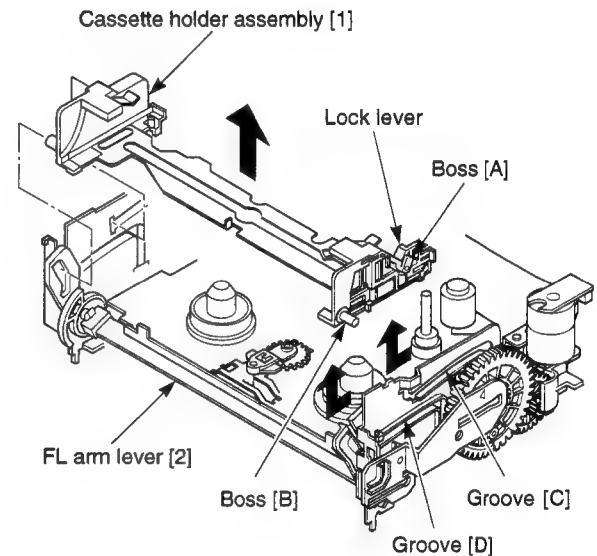


Fig. 2-6-4

5. Replace the cassette holder assembly with new one.
6. Mount it in the reverse order of removal.

#### Note:

Also, when mounting, mount it while releasing the lock lever.



### 2-6-5. FL Arm Lever Replacement

1. Remove the door open lever. (Refer to Item 2-6-2.)
2. Remove the FL cassette guide assembly. (Refer to Item 2-6-3.)
3. Remove the cassette holder assembly. (Refer to Item 2-6-4.)
4. Release the left side claw [A] of the FL arm lever from the boss of the mechanical deck by pulling to the arrow direction, and remove the FL arm lever [1] by pulling this side from the left side.

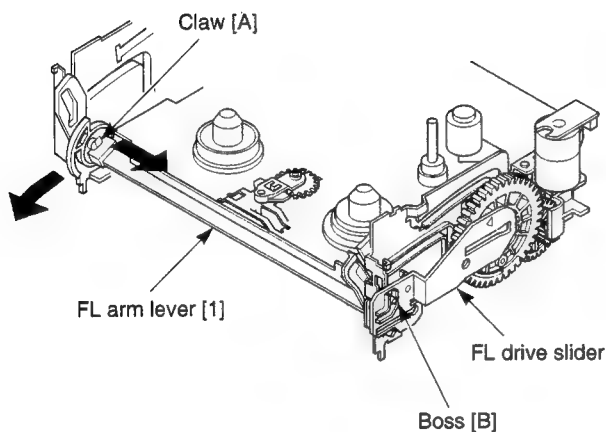


Fig. 2-6-5

5. Replace the FL arm lever with new one.
6. Mount it in the reverse order of removal.

#### Note:

Mount it so that the boss [B] of the FL arm lever [1] is inserted in the groove of the FL drive slider.

### 2-6-6. FL Drive Slider, Joint Gear 2, FL Cam Gear, and Joint Gear 1 Replacement

1. Remove the door open lever. (Refer to Item 2-6-2.)
2. Remove the FL cassette guide assembly. (Refer to Item 2-6-3.)
3. Remove the cassette holder assembly. (Refer to Item 2-6-4.)
4. Remove the FL arm lever. (Refer to Item 2-6-5.)
5. Move the FL drive slider [1] by sliding it this side slightly and adjusting the position of the mechanical deck boss portion to the wider groove portion of the slider, and then remove the FL drive slider [1] by pulling it out from the boss portion.

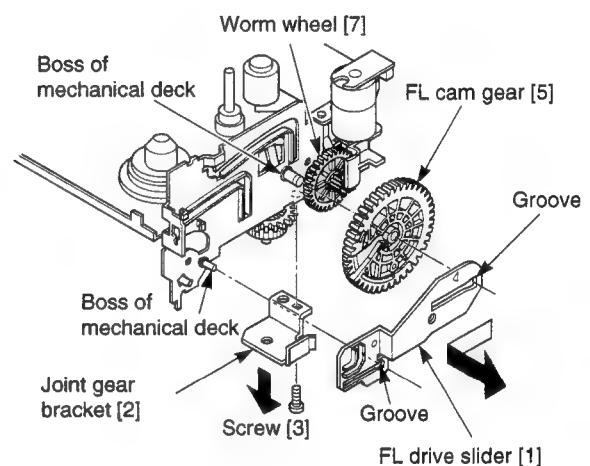


Fig. 2-6-6

6. Turn the mechanical deck over.
7. Remove one securing screw [3] on the joint gear bracket, and remove the joint gear bracket [2].
8. Remove the joint gear 2 [4].

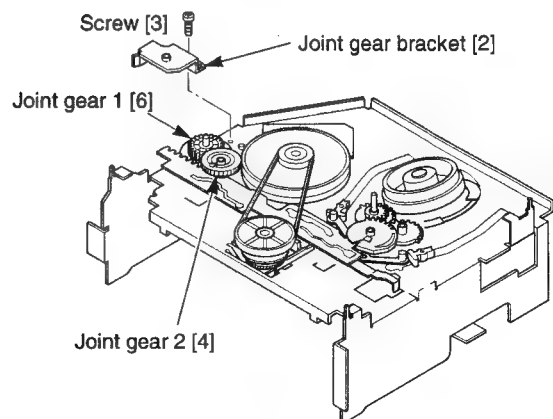
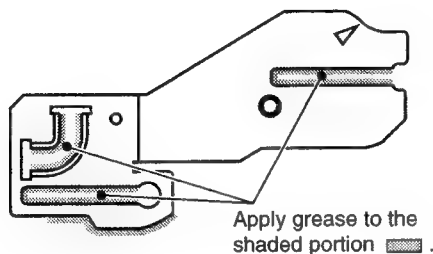


Fig. 2-6-7

9. Remove the FL cam gear [5].
10. Remove the joint gear 1 [6].
11. Replace the part with new one.

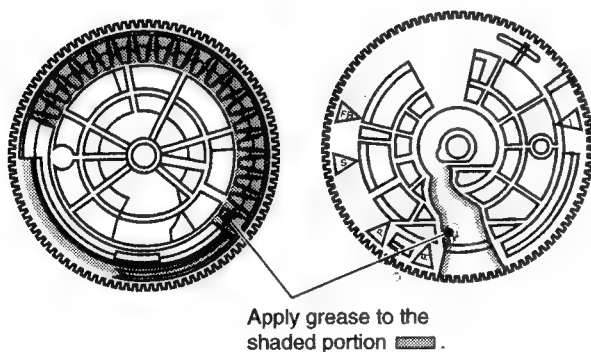
Apply an amount of grease on the following portion of the new part.



**Fig. 2-6-8 FL Drive Slider**

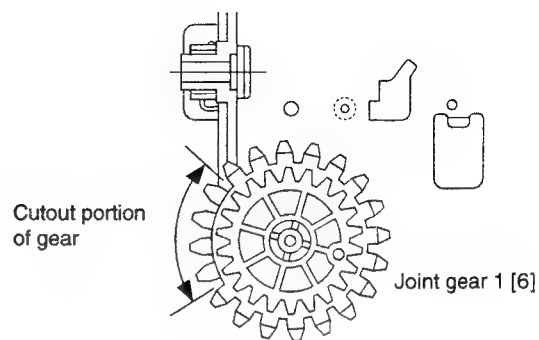


**Fig. 2-6-9 Joint Gear 1**



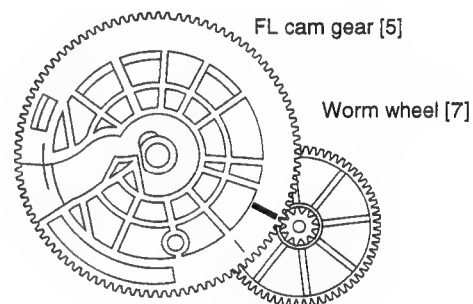
**Fig. 2-6-10 FL Cam Gear**

12. When mounting the joint gear 1 [6], mount it so that the cutout portion of the gear is faced with the direction of the FL cam gear [5].



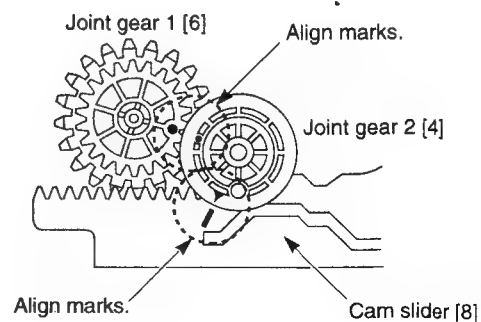
**Fig. 2-6-11**

13. When mounting the FL cam gear, align the mark of the FL cam gear [5] with the center of the worm wheel [7].



**Fig. 2-6-12**

14. When mounting the joint gear 2 [4], align the mark of the joint gear 1 [6] with the mark of the cam slider [8].



**Fig. 2-6-13**

15. Mount it in the reverse order of removal.

### 2-6-7. Worm Gear, Worm Gear Holder, Loading Motor, and Worm Wheel Replacement

1. Release the claw [A] of the worm gear holder from the cutout portion of the mechanical deck by bending it to the arrow direction, and remove the worm gear holder [1] by pulling downward.
2. Remove the worm gear [2].
3. Before removing the worm wheel [3], first remove the FL cam gear. (Refer to Item 2-6-6.)
4. Remove the worm wheel [3].
5. Remove one securing screw [5] on the loading motor, and remove the loading motor [4].

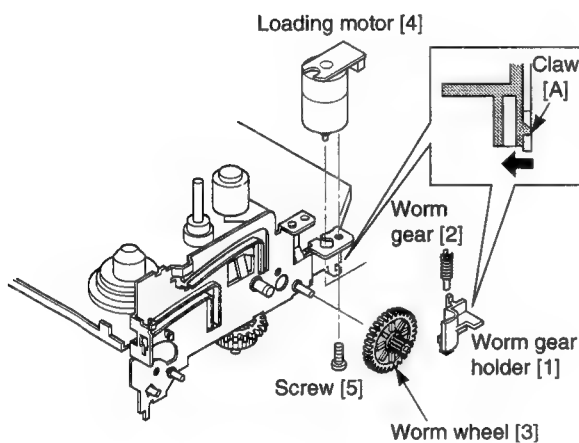


Fig. 2-6-14

6. Replace the part with new one.

After replacing with new part, apply an amount of grease on the following portion.

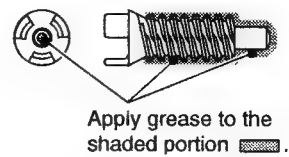


Fig. 2-6-15 Worm Gear

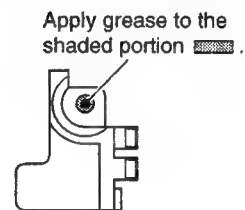


Fig. 2-6-16 Worm Gear Holder

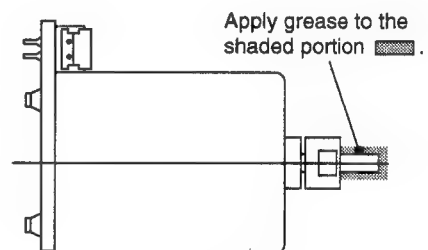


Fig. 2-6-17 Loading Motor

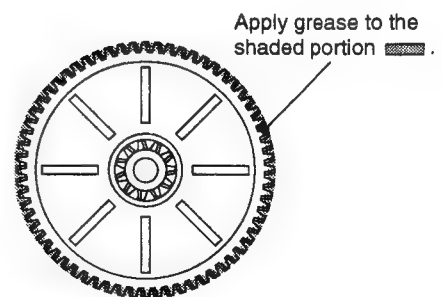


Fig. 2-6-18 Worm Wheel

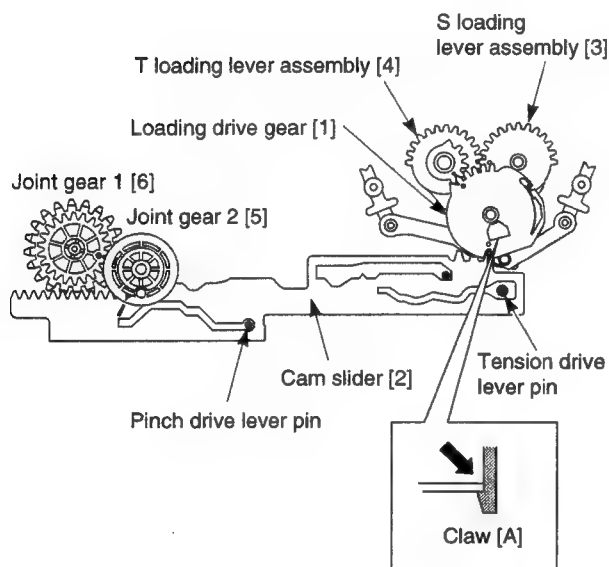
7. Mount it in the reverse order of removal.

#### Note:

After mounting the worm gear wheel, be sure that the claw [A] is locked properly.

### 2-6-8. Loading Drive Gear, Cam Slider, S,T Loading Lever Assembly, Pinch Drive Lever, and Tension Drive Lever Replacement

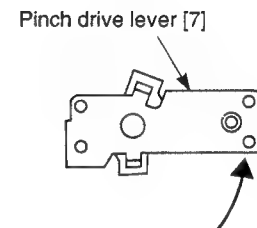
1. Turn the mechanical deck over, and turn it bottom upward.
2. Remove the reel belt.
3. Remove one securing screw on the joint gear bracket, and remove the joint gear bracket. (Refer to Item 2-6-6.)
4. Remove the joint gear 2. (Refer to Item 2-6-6.)
5. Release the claw [A] of the loading drive gear from the groove of the mechanical deck, and remove the loading drive gear [1].
6. Remove the cam slider [2].



**Fig. 2-6-19**

7. Remove the S, T loading lever assembly [3] and [4].
8. When removing the pinch drive lever [7], first, remove the cassette door guide, pinch assembly, and the joint lever (Refer to Item 2-6-14.), and then remove the T reel table (Refer to Item 2-6-12.).

Next, pull out the pinch drive lever after turning it counterclockwise from the bottom side of the mechanical deck.

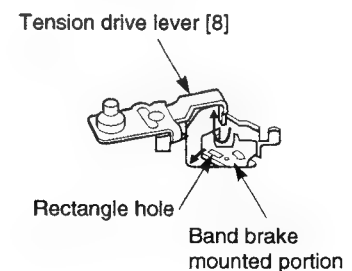


**Fig. 2-6-20 Bottom side of Mechanical Deck**

9. When removing the tension drive lever [8], first, remove the S reel table (Refer to Item 2-6-12). Next, turn the band brake mounting portion counterclockwise from the bottom side of the mechanical deck, and then remove the tension drive lever after turning it clockwise.

#### Note:

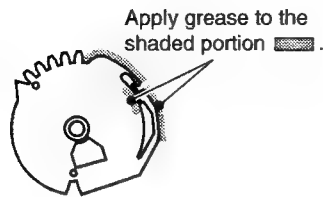
When turning the band brake mounting portion, do it by inserting a screw driver into the rectangle hole. At this time, pay attention not to bent it upward and downward. After mounting, check the tension post position, and perform the adjustment and the confirmation of the back tension. (Refer to the section 2-7-1. Tension Post Position Check, and 2-7-2. (2) Reel Torque Check and Back Tension Check.)



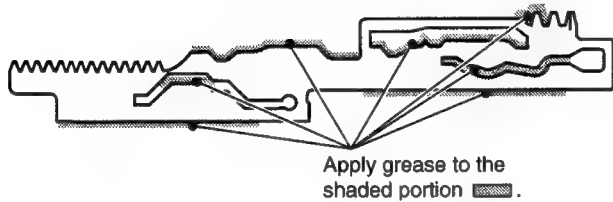
**Fig. 2-6-21 Bottom side of Mechanical Deck**

10. Replace the part with new one.

Apply an amount of grease on the following portion of the new part.

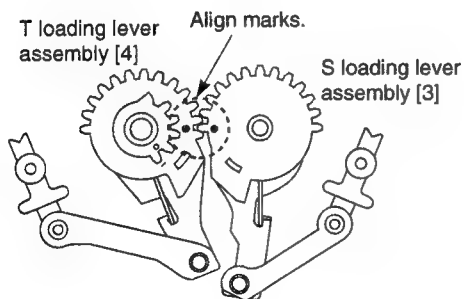


**Fig. 2-6-22 Loading Drive Gear**



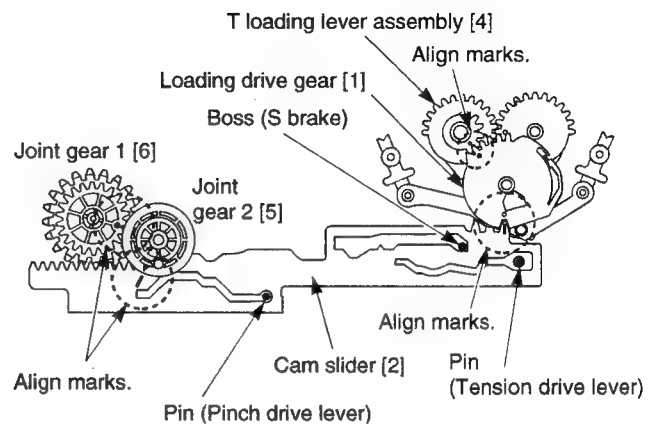
**Fig. 2-6-23 Cam Slider**

11. When mounting the S, T loading lever assembly [3] and [4], align the marks.



**Fig. 2-6-24**

12. When mounting the cam slider [2], loading drive gear [1], and the joint gear 2 [5], align the marks of the marking portions.



**Fig. 2-6-25**

13. Mount it in the reverse order of removal.

### 2-6-9. Tension Lever, Band Brake, and Tension Sleeve Replacement

1. Remove the top bracket. (Refer to Item 2-6-1.)
2. Remove the S brake. (Refer to Item 2-6-11.)
3. Remove the tension spring [1].
4. Lift up slightly the hole side of the tension sleeve [3] mounted to the mechanical deck, and turn it to the left or right direction, and then remove the tension sleeve [3] by adjusting the claw of the tension sleeve to the cutout portion of the mechanical deck. Also remove the tension lever [2].

#### Note:

When replacing the tension lever and the band brake, it is not necessary to remove the tension sleeve, and remove it after turning clockwise by inserting the screw driver to the rectangle hole [A].

At this time, pay attention not to bent it upward and downward.

5. Remove the band brake [4] of the tension lever side by adjusting the claw of the band brake to the groove of the tension lever [2] turning it in a right direction.
6. Remove the band brake [4] by adjusting the claw of the band brake to the groove of the band brake mounting portion at the mechanical deck side.
7. Replace the part with new one.
8. Mount it in the reverse order of removal.

#### Note:

- After replacing the tension lever [2], apply an amount of oil to the support post.
  - Take care not to dirty, bent, and damage the felt face of the band brake [4].
9. After mounting, confirm the tension post position, also confirm the adjustment and back tension. (Refer to the section 2-7-1. Tension Post Position Check, and 2-7-2. (2) Reel Torque Check and Back Tension Check.)
  10. After replacing, perform the adjustment according to the linearity adjustment of the tape transport system adjustment item.

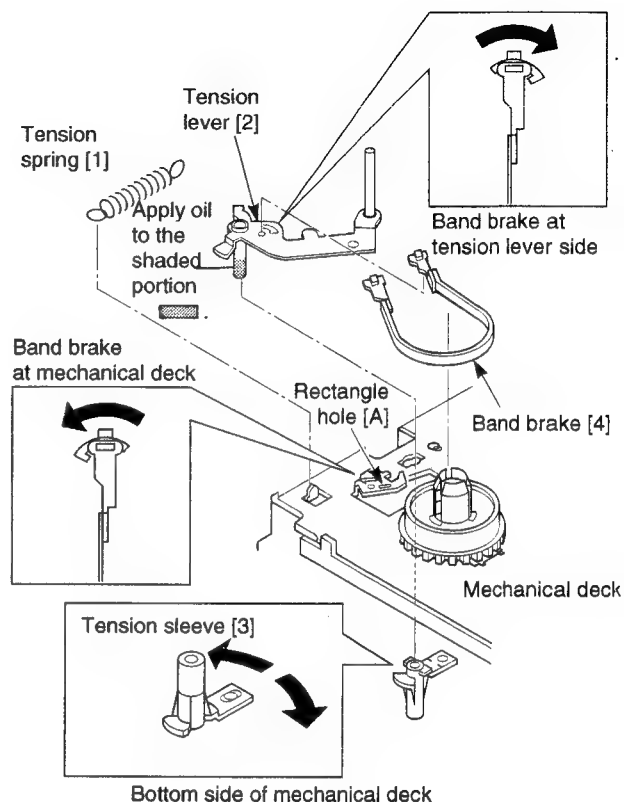


Fig. 2-6-26

### 2-6-10. Clutch Gear Assembly, Idle Lever Assembly, and Up/Down Lever Replacement

1. Remove the cam slider when removing the up/down lever [4]. (Refer to Item 2-6-8.)
2. Remove the stop ring [2], and remove the clutch gear assembly.
3. Release the claw [A] of the idle lever assembly from the mechanical deck, and remove the idle lever assembly [3].
4. Release two claws [B] from the mechanical deck, and remove the up/down lever [4].
  - Apply a drop of oil on the top of the center post after cleaning the center post with the cleaning kit.  
(When replacing the idle lever assembly, up/down lever, clutch gear assembly)
  - Apply an amount of grease to the protrusion [C] of the up/down lever.  
(When replacing the up/down lever)
5. Replace the part with new one.
6. Mount it in the reverse order of removal.
  - Confirm the reel torque using the torque cassette.  
(When replacing the clutch gear assembly and replacing the idle lever assembly)

#### Note:

Replace the stop ring [2] which the slit is opened with new one since it can not be used again.

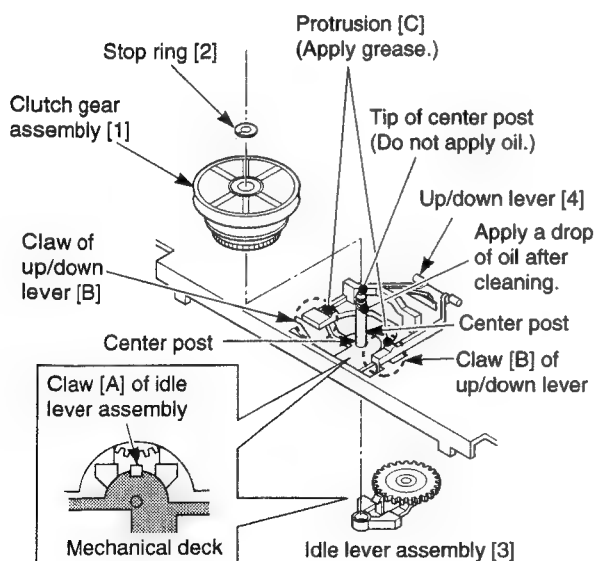


Fig. 2-6-27

### 2-6-11. S, T Brake Assembly Replacement

1. Remove the brake spring [3] located between S, T brake [1] and [2].
2. Release claws [A] and [B] of the S, T brake, and remove the S, T brake [1] and [2].
3. Replace each part, with new one.
4. Mount it in the reverse order of removal.

#### Note:

- When replacing the S brake assembly, pay attention not to crush the band brake.
- When mounting the S brake assembly, push the portion of swinging center and the claw [A] after inserting the [C] portion to the lower side of the flange [D].

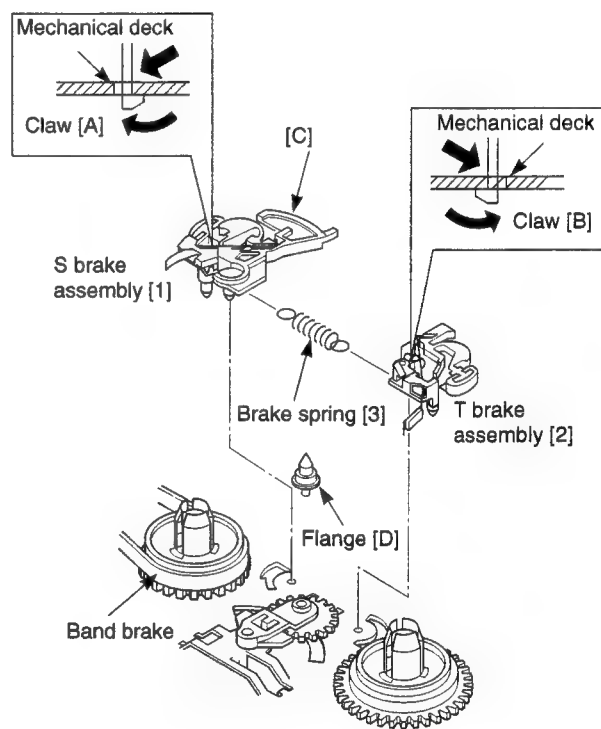


Fig. 2-6-28

### 2-6-12. S,T Reel Table Replacement

1. Remove the S, T reel table. (Refer to Item 2-6-11.)
2. Remove the band brake. (Refer to Item 2-6-9.)
3. Remove the stop ring [3], and remove the S, T reel table [1] and [2] pulling it from the reel shaft.
4. Apply an amount of oil to the top portion and sitting portion of the reel shaft after cleaning the reel shaft [A] and [B] with the cleaning kit.
5. Replace each part with new one.
6. Mount it in the reverse order of removal.

#### Note:

- Replace the stop ring [3] which the slit is opened with new one since it can not be used again.
- When inserting the T reel table, pay attention not to crush the pad of the T brake assembly.

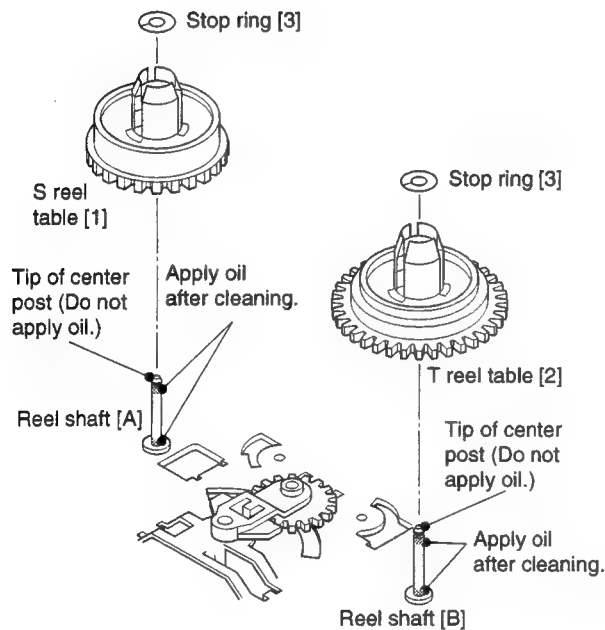


Fig. 2-6-29

### 2-6-13. S,T Slider Assembly Replacement

1. Remove the top bracket. (Refer to Item 2-6-1.)
2. Remove the S, T loading lever assembly. (Refer to Item 2-6-8.)
3. Remove the S brake. (Refer to Item 2-6-11.)
4. Remove the tension lever. (Refer to Item 2-6-9.)
5. When replacing the T slider assembly, remove the clutch gear assembly and up/down lever. (Refer to Item 2-6-10.)
6. Remove the S, T slider assembly by sliding the S, T slider assembly [1] and [2] until the cutout portion of the S, T loading grooves [A] and [B] on the mechanical deck.
7. Replace each part with new one.
8. Mount it in the reverse order of removal.
9. After mounting, perform the adjustment according to the 2-7-3. Tape Transport System Adjustment.

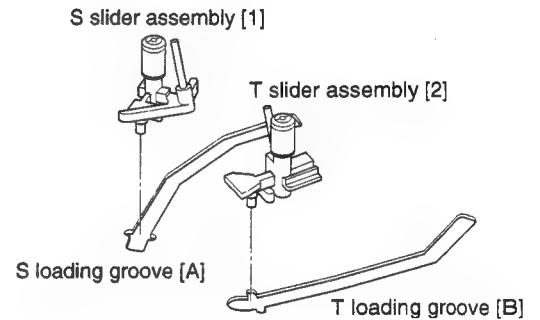


Fig. 2-6-30



## 2-6-14. Pinch Assembly, No. 9 Guide Lever, and Cassette Door Guide Replacement

1. Lift up the claw [A] of the cassette door guide [1] and remove the cassette door guide [1] by turning it clockwise.
2. Remove the pinch assembly [2] pulling it up straight from the pinch support post [3].
3. Remove the lever [5] jointed between the pinch drive lever [4] and the pinch assembly [2].
4. Remove the spring [7] between the No.9 guide lever [6] and the mechanical deck.
5. Remove the No. 9 guide lever [6].
6. Replace the part with new one.
7. Mount it in the reverse order of removal.
8. After mounting, perform the adjustment according to the 2-7-3. Tape Transport System Adjustment.

### Note:

- After mounting the worm gear wheel, be sure that the claw [A] is locked properly.
- Take care not to touch the surface of the pinch roller, and not to stick the grease.
- Be sure to apply an amount of grease to the portion contacted with the pinch assembly [2] around the pinch support post [3].
- After replacing the No. 9 guide lever [6], be sure to apply an amount of oil around the support post, and apply an amount of grease to the end of the guide post.

Also, pay attention not to stick the grease on the transportation surface of the No. 9 guide lever.

- Confirm the guide post end of the No. 9 guide lever [6] touches the top surface of the mechanical deck.

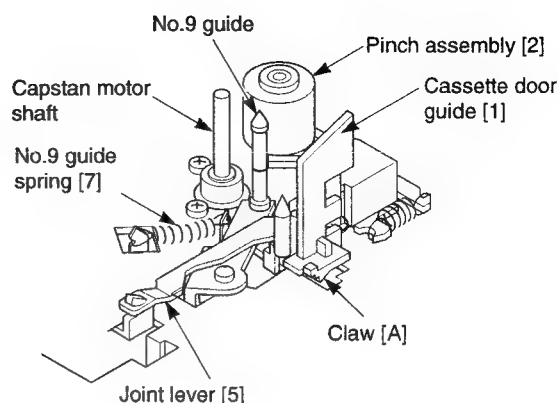


Fig. 2-6-31

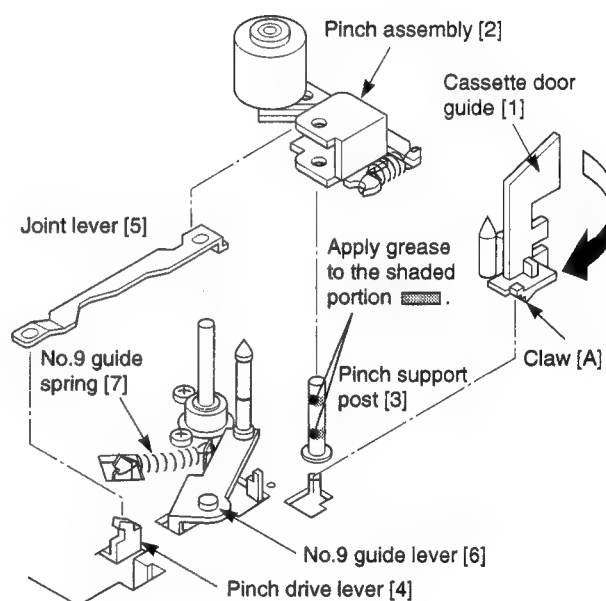


Fig. 2-6-32

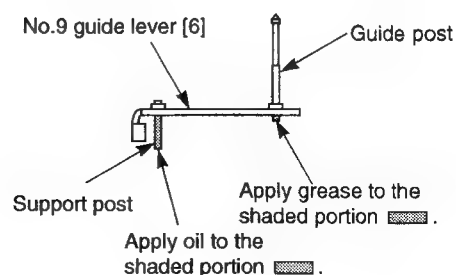


Fig. 2-6-33

### 2-6-15. FE Head Replacement

1. Remove one securing screw [2] on the FE head, and remove the FE head [1].
2. Replace the FE head with new one.
3. Mount it in the reverse order of removal.
4. After mounting, perform the adjustment according to the 2-7-3. Tape Transport System Adjustment.

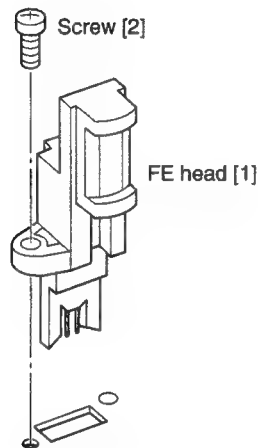


Fig. 2-6-34

### 2-6-16. ACE Head Assembly Replacement

1. Remove the FFC [1] from the connector.
2. Remove one securing screw [2] on the ACE head assembly, and remove the ACE head assembly [3].
3. Replace the ACE head with new one.

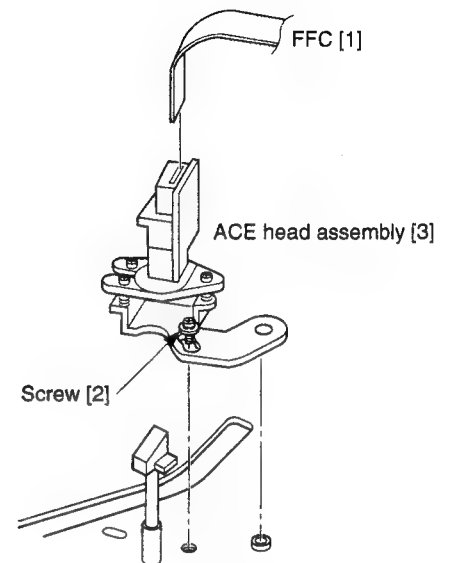


Fig. 2-6-35

4. When mounting the ACE head assembly [3] to the mechanical deck, mount it by aligning the slit [C] of the mechanical deck with the slit [D] of the ACE head bracket after aligning the hole [A] of the ACE head bracket to the boss hole [B] of the mechanical deck.

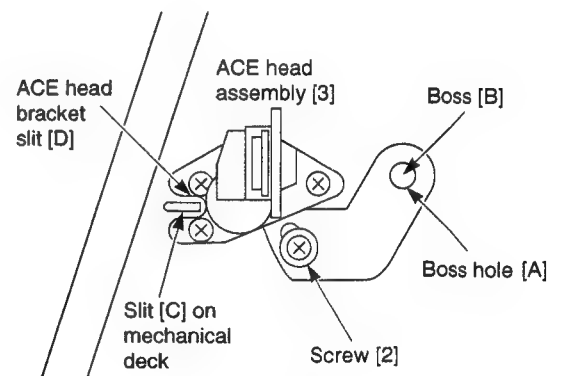


Fig. 2-6-36

- (5) Mount it in the reverse order of removal.
- (6) After mounting, perform the adjustment according to the 2-7-3. Tape Transport System Adjustment.

#### Note:

Take care when replacing, since the part number of ACE head assembly is different between the models.

### 2-6-17. Head Cleaner Assembly and Head Cleaner Sleeve Replacement

1. Release the hook [A] of the head cleaner assembly from the mechanical deck, and pulling out the head cleaner assembly [1] upward.
2. When replacing the head cleaner sleeve [2], pull it out by lifting the F portion and turning it in 90 degrees.

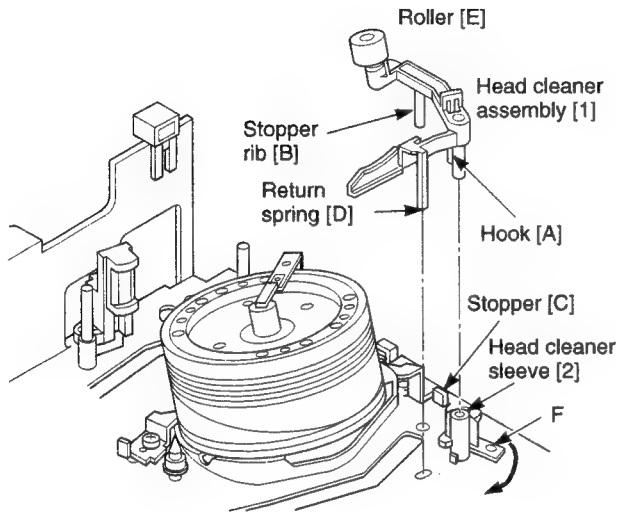


Fig. 2-6-37

3. Replace the head cleaner assembly with new one.
4. Mount it in the reverse order of removal.

#### Note:

- Take care not to stick the grease, oil and etc. on the roller [E].
- When mounting the head cleaner assembly [1], mount it so that the stopper rib [B] sits inside (cylinder side) of the cylinder mounting bracket stopper [C]. Also, be sure that the return spring [D] is inserted correctly in the hole of the main base.

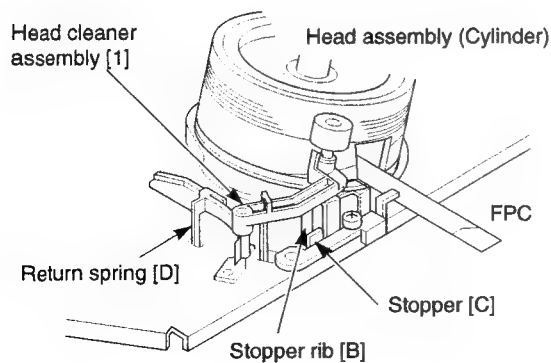


Fig. 2-6-38

### 2-6-18. Ground Brush Assembly Replacement

1. Remove one securing screw [2] on the ground brush assembly.
2. Remove the ground brush assembly [1].
3. Replace the ground brush assembly with new one.

#### Note:

- Take care not to apply force to the cylinder.
4. Mount it in the reverse order of removal.

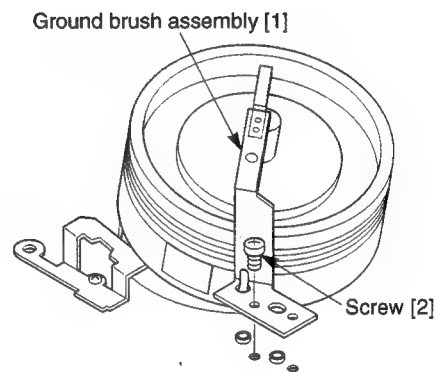


Fig. 2-6-39

## 2-6-19. Cylinder Holding Plate Replacement

1. Remove the head cleaner assembly [1]. (Refer to Item 2-6-17.)
2. Remove two securing screws [5] and [6] on the cylinder holding plate A [2] and the cylinder holding plate B [3] and then remove them [2] and [3] by sliding in the arrow direction.

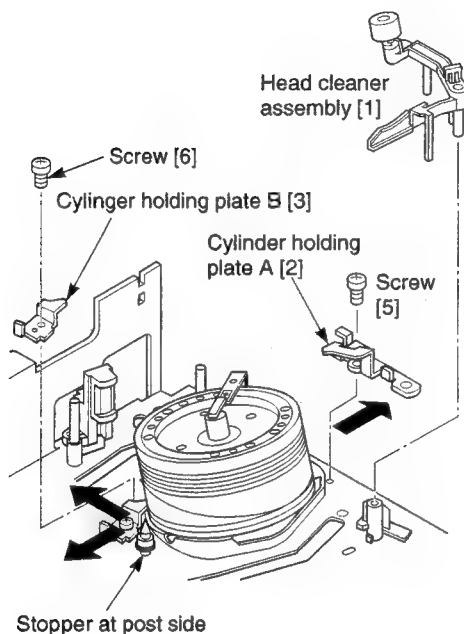


Fig. 2-6-40

3. Replace the part with new one.
4. Mount it in the reverse order of removal.
5. Fix the cylinder holder plate A [2] and B [3] with screws [5] and [6] while pushing slightly in the direction shown by the arrow.

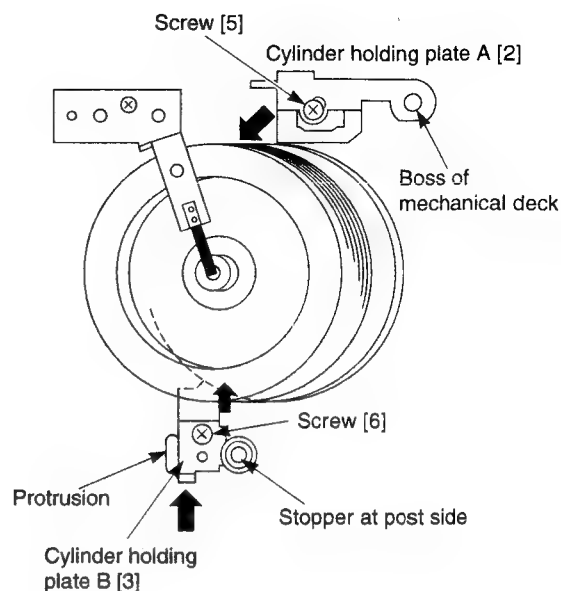


Fig. 2-6-41

### Note:

- Tightening order of the securing screws [5], [6] is 294 to 392 mN•m (3 to 4kg•cm).
- Take care of the position inserting the FPC when mounting the cylinder holding plate A [2]. (Refer to Item 2-6-20.)
- When replacing the cylinder holding plate B [3], take care not to damage the cylinder and the tape guide etc.

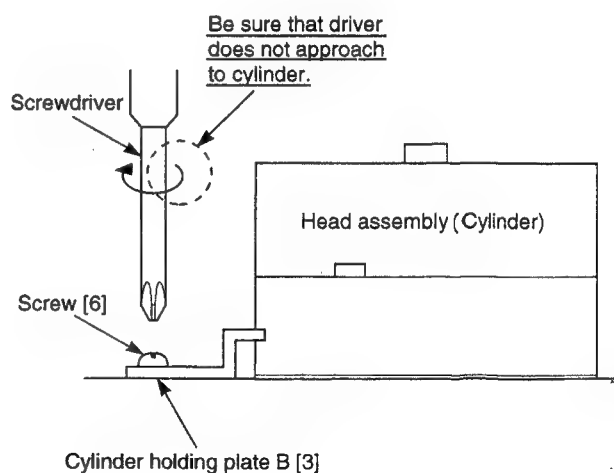


Fig. 2-6-42

## 2-6-20. Head Assembly (Cylinder) Inspection and Replacement

### <Inspection>

1. Check if the tape transport surface on the head assembly is not damaged.
2. Check if the rotation of the head assembly is not abnormal.
3. Check if the video head is not damaged and wear.  
(It can be checked easier by using the head checker.)
4. Check if the video head is not blocked. (When it can't be eliminated by cleaning)
5. Check if the FPC [A] is not damaged.

If some abnormality is found after checking above (1) to (5), replace the head assembly (cylinder) with new one.

### <Replacement>

1. Remove the ground brush assembly [1]. (Refer to Item 2-6-18.)
2. Remove the head cleaner assembly [2]. (Refer to Item 2-6-17.)
3. Remove the FPC (A) from the main PC Board.
4. Remove the cylinder holding plate A [3] and cylinder holding plate B [4]. (Refer to Item 2-6-19.)
5. Remove the head assembly [6].
6. Replace the head assembly with new one.
7. When mounting, take care of the direction of the head assembly.
8. Remount the head assembly in the reverse order of removal. Fix the head assembly pressing slightly in the direction shown by the arrow a, the cylinder holding plate A [3] pressing slightly in the direction shown by the arrow b, and the cylinder holding plate B [4] pressing slightly in the direction shown by the arrow c. (Tightening torque : 294 to 392 mN•m (3 to 4kg•cm))

Fix the ground brush assembly [1] with the screw [7] after adjusting the boss of the mechanical deck to the boss hole of the holder plate. (Tightening torque : 294 to 392 mN•m (3 to 4kg•cm))

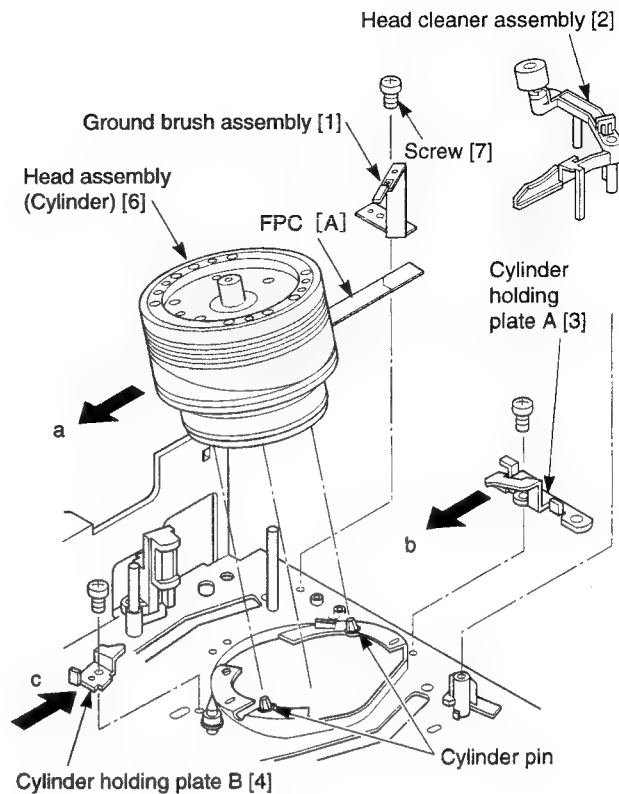


Fig. 2-6-43

### Note:

- When remounting the cylinder holding plate A [3], after confirming that the FPC [A] is hooked at the groove on the lower head assembly properly, insert the FPC under the tip of the cylinder holding plate. However, this is not applied for the type which has no cylinder window.
- When replacing, take much care not to touch the video head directly and damage the cylinder.

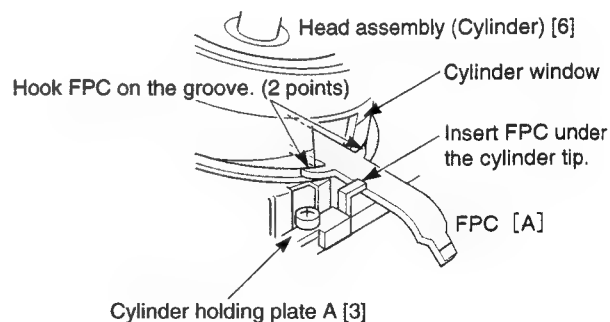


Fig. 2-6-44

9. After mounting, perform the adjustment according to the 2-7-3. Tape Transportation System Adjustment.

### 2-6-21. Capstan Motor Assembly and Reel Belt Replacement

1. Remove the reel belt [1].
2. Remove three screws [3] from the front side of the mechanical deck while keeping the capstan motor assembly [2] of the mechanical deck bottom side.
3. Replace the capstan motor with new one.
4. Insert the capstan motor assembly [2] from the bottom side of the mechanical deck while taking care not to hit or damage the shaft and whole motor, so that the positioning hole of the mechanical deck and the positioning hole of the capstan motor assembly fit.
5. Fix the capstan motor assembly with three screws [3] by fixing evenly while keeping the capstan motor assembly of the mechanical deck bottom side.  
At this time, adjust it so that the hole of the mechanical deck and the positioning hole of the capstan motor is fit.

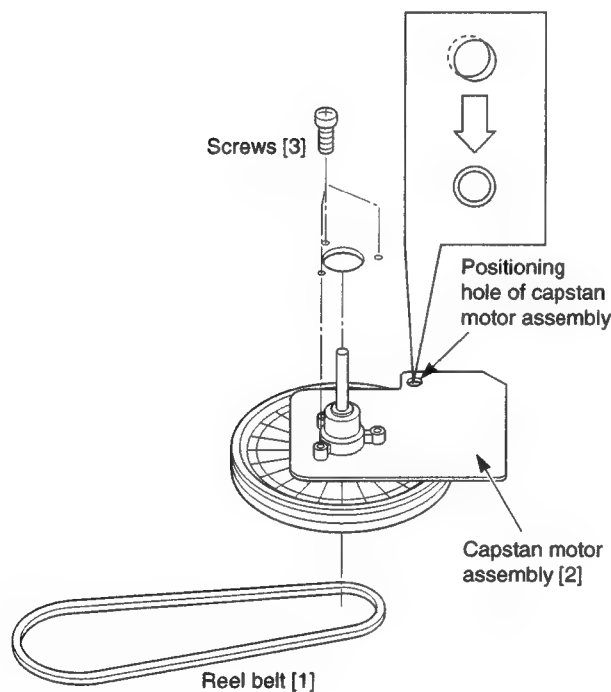


Fig. 2-6-45

### Note:

- Do not use once-removed screws again.
- When mounting, take care of float of screw.

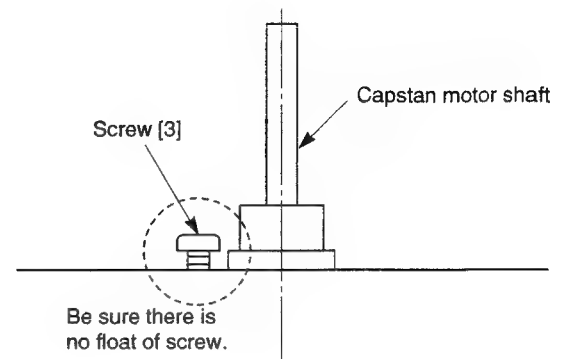


Fig. 2-6-46

6. After replacing, mount it in the reverse order of removal.

### Note:

- In this case, take care not to twist the reel belt and stick the grease.
7. After mounting, perform the adjustment according to the 2-7-3. Tape Transportation System Adjustment.

### 2-6-22. No. 8 Guide Cap Replacement

1. Press the No. 8 guide cap for replacement forcibly after pulling out the No.8 guide cap [1] from the No. 8 guide [2].
2. Mount the No. 8 guide cap by facing the slant surface to cassette side.

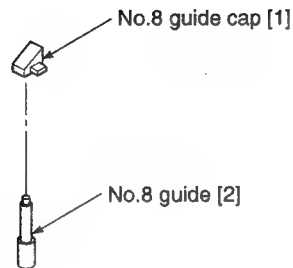


Fig. 2-6-47

## 2-7. Check and Adjustment

### 2-7-1. Check of Tension Post Position

1. Turn the worm wheel clockwise after removing the cassette holder assembly on the front loading mechanism, and set the cam gear at playback mode. (Refer to Fig. 2-4-3 Cam Position.)
2. Turn the S reel table [1] clockwise two rounds slowly.
3. While turning the S reel table [1], insert a slot type screwdriver to the rectangle hole of the adjuster portion [3] so that the outer periphery of the left end on the tension lever [2] is put on the marking of the mechanical deck, and adjust it by turning clockwise or counterclockwise.
4. After turning the S reel clockwise again, check that the deviation to the marking is within 1mm.

#### Note:

- There is a long mark at the position of 1.3mm from the round surface of the mechanical deck. Make sure the position of the mark when adjusting.
- When turning the adjuster portion [3], take care not to apply force in upper and lower direction.

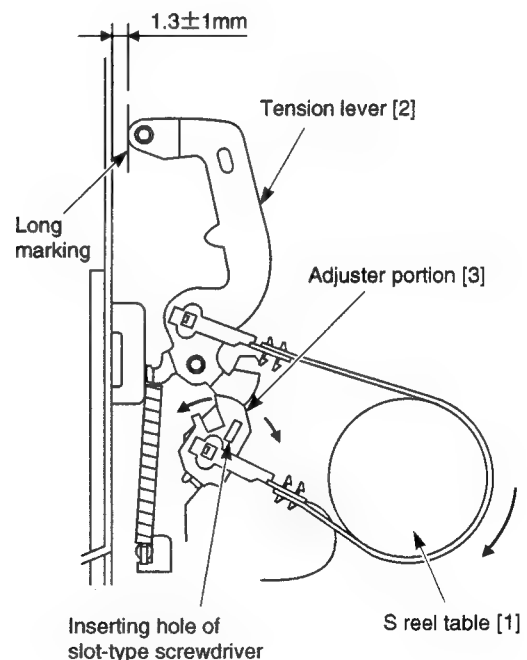


Fig. 2-7-1

## 2-7-2. Reel Torque Check

### (1) Reel torque

1. REV..... supply side  
Poor torque may not wind the tape. On the other hand, excessive torque will cause damage to the tape during REVIEW mode.
2. REC/PLAY ..... take-up side  
Too low torque does not rewind the tape to the end. If too high torque, the tape may be stretched by excessive tension.
3. Inspection  
Rewind the torque cassette to the end, then check the torque value shown below:  
Review (SPx7)  
 $14.2 \pm 3.9 \text{ mN}\cdot\text{m}$  ( $145 \pm 40 \text{ g}\cdot\text{cm}$ )  
Recording/Playback  
 $6.8 \pm 2.6 \text{ mN}\cdot\text{m}$  ( $69.5 \pm 26.9 \text{ g}\cdot\text{cm}$ )  
For the checking method, refer to the following item (2).

### (2) Reel torque and back tension check

1. Record a signal on the torque cassette tape (KT-300NR) in the SP mode.
2. Load the torque cassette tape (KT-300NR) in the VTR and feed it forward until the end of the tape, before proceeding with measurement.
3. Set the VTR to the REVIEW mode and feed the tape for about 15s, and then make sure the take-up torque described above is obtained while observing the left torque meter.
4. After completion of step (c), feed forward to tape start position and set the VTR to the PLAY mode. After feeding the tape for about 30s, check the torque measures  $4.4$  to  $9.8 \text{ mN}\cdot\text{m}$  ( $45$  to  $100 \text{ g}\cdot\text{cm}$ ) reading the right torque meter. Also, check the back tension torque measures  $4$  to  $7 \text{ mN}\cdot\text{m}$  ( $41$  to  $71 \text{ g}\cdot\text{cm}$ ) reading the left torque meter.
5. If the review torque and playback torque are out of limit specification, replace the clutch assembly. (Refer to Item 2-6-10.)
6. When the clutch gear assembly and the idle lever assembly, perform the reel torque check.

### <Precautions for Use of Torque Cassette (KT-300NR)>

1. Before loading a torque cassette in a VTR, always remove tape slack. The tape slack can be removed by rotating the reel in the cassette to its take-up direction. (The tape tends to slack since there is no reel brake on the torque cassette.)
2. When the torque cassette is loaded, confirm following:
  - 1) Make sure the tape does not ride up or over the No. 8 cap. If it does, do not eject the tape but return the tape to its correct position, taking care not to damage the tape.
  - 2) Make sure the tape is not slackened. If slackened, operate the VTR in FF or REW mode and then stop the tape. Then make sure the tape is not slackened again.
  - 3) After above confirmation, proceed to the real torque adjustment and confirmation.
3. Caution for removal of torque cassette
  - 1) When removing the torque cassette from the VTR, set the VTR to the STOP mode and wait for several seconds. Then, make sure the tape is not slackened, and push the EJECT button to remove the cassette.
4. If the previous precautions "1.", "2." and "3." are not performed properly, the tape may be damaged and correct measurements can not be performed.
5. Do not use worn out or damaged tape, if used they may damage video heads on the cylinder. In such a case always replace the tape with a new one. The replacement tape is of E-180, 10 m in length.



### 2-7-3. Tape Transport System Adjustment

The tape transport system has been precisely adjusted in the factory, so only when some defective phenomenon occurs such as noise observed on the screen and tape damage, or when replacing the portion shown on the adjustment procedures of the tape transport system, adjustment and check are necessary.

Electrical signal output terminal required for adjustment differs depending upon the models. Refer to the test point location in the Electrical Adjustment Section.

#### (1) Location of tape transport adjustment

##### <Adjustment reference>

Lower flange height of No.8 guide is used as the basic reference for the transport adjustment. To keep height of the No.8 guide, do not apply excessive force onto the main base to prevent the main base from deformation.

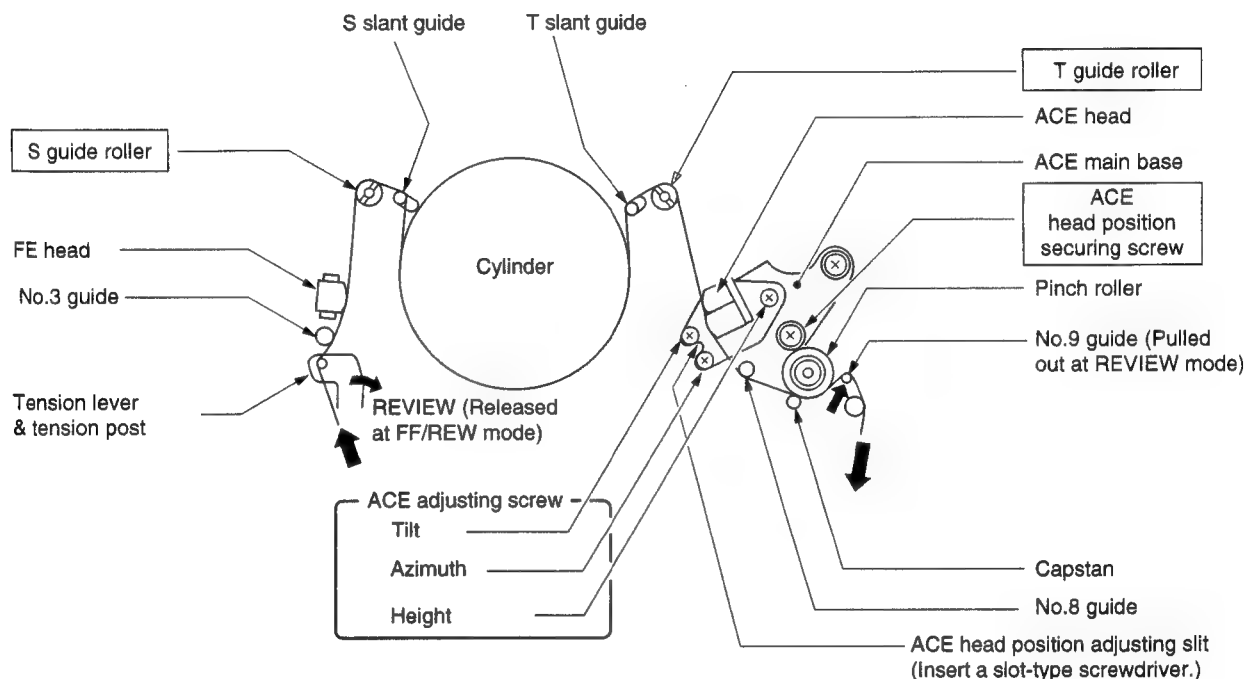


Fig. 2-7-2

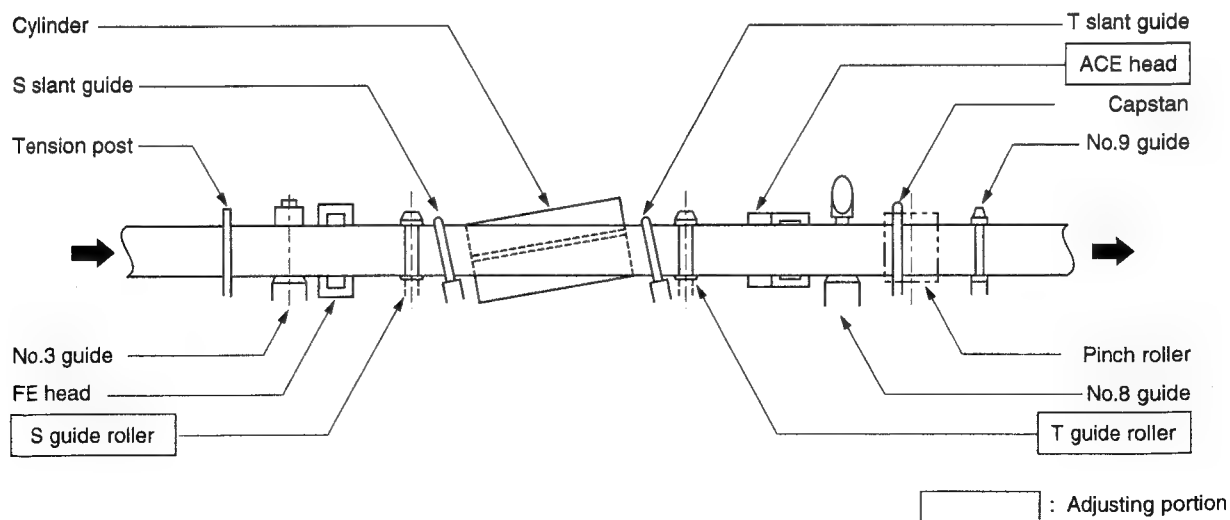


Fig. 2-7-3

**Service Manual: Tapes and Video Deck**

**Pre-Adjustment Replacements:**

- Head assembly (cylinder) assembly replacement
- S, T slider assembly replacement
- ACE head assembly replacement
- Capstan motor assembly replacement
- Pinch lever assembly replacement

**Adjustment Sequence:**

- ACE head assembly rough adjustment**
- Playback phase adjustment**
- Linearity adjustment (S, T guide roller)**
- ACE head fine adjustment**
- No. 9 guide check (at REV mode)**

**Adjustment (a) ACE head assembly rough adjustment:**

- 1. AUDIO HEAD HEIGHT ADJUSTMENT (AUDIO HEIGHT ADJUSTING SCREW)**  
Playback the tape recorded in SP mode. Align position of the upper end of tape and that of the audio head.
- 2. AUDIO HEAD TILT ADJUSTMENT (TILT ADJUSTING SCREW)**  
Playback the tape in SP mode continuously. Adjust Audio head tilt screw so that tape runs along lower flange of No. 8 guide.
- 3. AUDIO AZIMUTH ADJUSTMENT (AZIMUTH ADJUSTING SCREW)**  
Playback 7 kHz audio signal on alignment tape and adjust for max. output.
- 4. ACE HEAD POSITION ADJUSTMENT**  
Playback video envelope signal 3 MHz (A ch) on alignment tape in SP mode. Reset tracking control at its center. Adjust ACE main base to obtain max. output.

**Adjustment (b) Playback phase adjustment:**  
Adjust as described in the Electrical Adjustment Section (Servo circuit.) in each service manual.

**Adjustment (c) Linearity adjustment (S, T guide roller):**

- 1. MAXIMUM ENVELOPE OUTPUT**  
Playback the 3 MHz video signal on the alignment tape. Trigger scope with switching pulse. Adjust tracking control for maximum envelope output by pushing tracking up/down buttons.
- 2. ENTRANCE SIDE ENVELOPE ADJUSTMENT**  
Rotate S guide roller until entrance side envelope becomes as flat as possible.
- 3. EXIT SIDE ENVELOPE ADJUSTMENT**  
Rotate T guide roller until exit side envelope becomes as flat as possible.
- 4. LINEARITY CHECK**  
Press the tracking up/down buttons alternately, make sure envelope increases or decreases with flat response kept.

**Note 1:** For the linearity adjustment (c), make sure adjusted value should be checked with 3 MHz/SP mode after completion of specified adjustments using 3 MHz/LP signal in alignment tape.

**Adjustment (d) ACE head fine adjustment:**

- 1. AUDIO HEAD HEIGHT FINE ADJUSTMENT**  
Playback stereophonic alternative recording signal (300-500Hz) on alignment tape. Turn the Audio height adjusting screw until audio envelope signal becomes as flat as possible.
- 2. AUDIO HEAD TILT FINE ADJUSTMENT**  
Playback alignment tape in CUE or double speed mode. Adjust Audio head tilt until tape runs along lower flange of No. 8 guide.
- 3. AUDIO HEAD HEIGHT CHECK**  
Playback signal as described in step 1, make sure audio envelope signal becomes as flat as possible.
- 4. AUDIO HEAD AZIMUTH FINE ADJUSTMENT**  
Playback 7 kHz audio signal on alignment tape. Turn the azimuth adjusting screw to obtain maximum output.
- 5. AUDIO HEAD HEIGHT RE-CHECK**  
Repeat same step as step 3.

**Adjustment (e) No. 9 guide check (at REV mode):**

- 1. TAPE WRINKLE CHECK**  
• Playback E-240 tape in Review mode.  
• Confirm the portion of upper/lower flange on No.8 guide.
- 2. NO. 9 GUIDE ADJUSTMENT**  
If tape travels out of upper/lower flange as shown above, pinch lever or capstan motor or No.9 guide lever is defective. Replace the defective part (s).

**Diagrams:**

- Diagram 1:** Shows the audio head and tape alignment for height adjustment.
- Diagram 2:** Shows the audio head tilt adjustment relative to the No. 8 guide flange.
- Diagram 3:** Shows the tape path and guide rollers (S and T) for linearity adjustment.
- Diagram 4:** Shows the tape path and guide rollers (S and T) for fine adjustment.
- Diagram 5:** Shows the tape path and guide rollers (S and T) for No. 9 guide adjustment.

**Flowchart:**

```

graph TD
    A[Pre-Adjustment Replacements] --> B[ACE head assembly rough adjustment]
    B --> C[Playback phase adjustment]
    C --> D[Linearity adjustment S, T guide roller]
    D --> E[ACE head fine adjustment]
    E --> F[No. 9 guide check at REV mode]
    F --> G[TAPE WRINKLE CHECK]
    G --> H[NO. 9 GUIDE ADJUSTMENT]
    H --> I[ACE HEAD POSITION ADJUSTMENT]
    I --> J[AUDIO HEAD HEIGHT ADJUSTMENT]
    J --> K[AUDIO HEAD TILT ADJUSTMENT]
    K --> L[AUDIO AZIMUTH ADJUSTMENT]
    L --> M[ACE HEAD POSITION ADJUSTMENT]
    M --> N[AUDIO HEAD HEIGHT FINE ADJUSTMENT]
    N --> O[AUDIO HEAD TILT FINE ADJUSTMENT]
    O --> P[AUDIO HEAD HEIGHT CHECK]
    P --> Q[AUDIO HEAD AZIMUTH FINE ADJUSTMENT]
    Q --> R[AUDIO HEAD HEIGHT RE-CHECK]
    R --> S[Repeat same step as step 3]
    S --> T[Repeat same step as step 3]
    
```

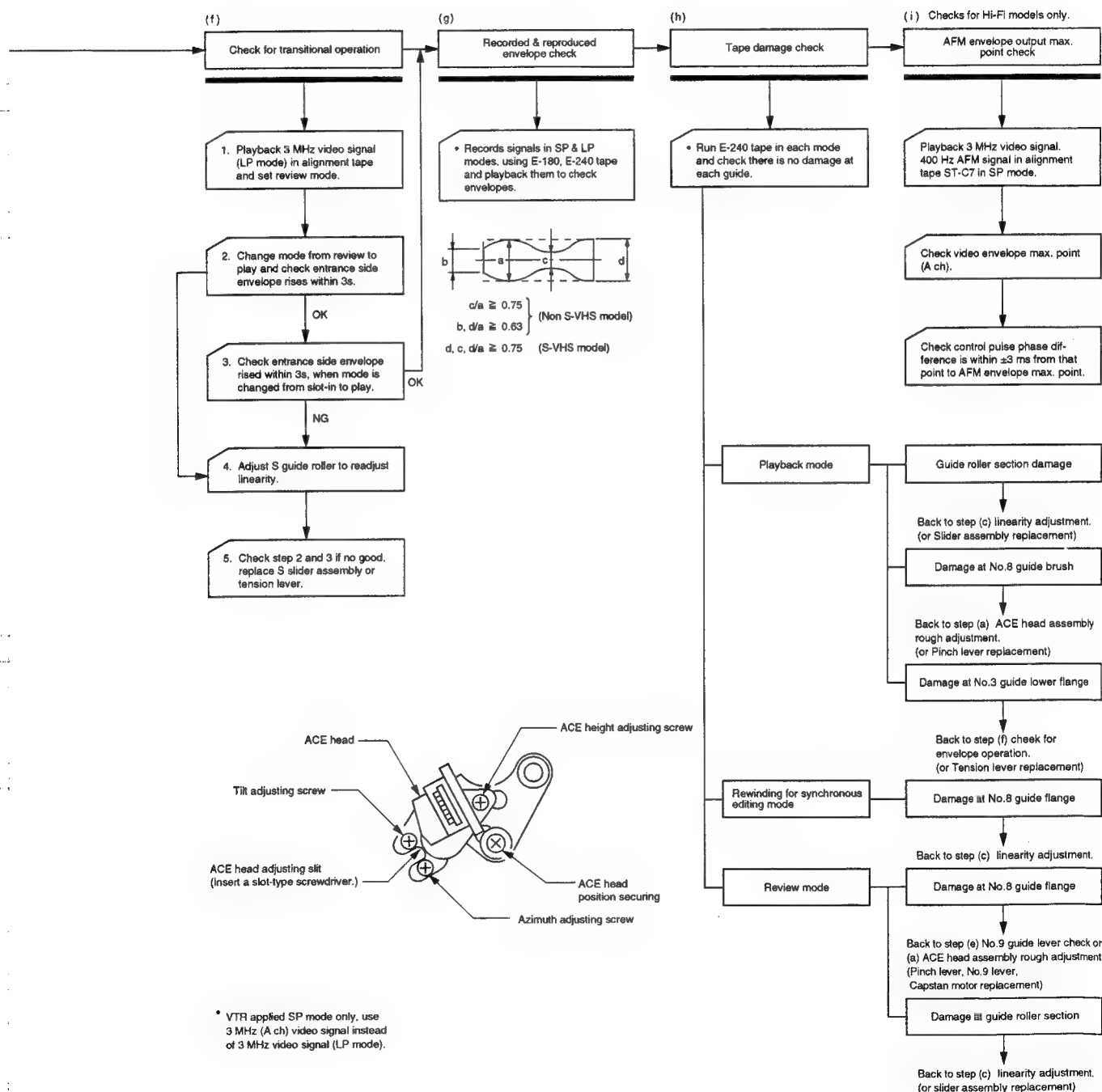


Fig. 2-7-4

### (3) Tape transport system adjustment

#### <Rough adjustment>

When the part(s) listed in Table 2-7-1 is replaced, perform required adjustments by referring to procedures for the tape transport system. When the part (s) listed in Table 2-7-1 is replaced, the tape path may be changed and may damage alignment tape. To prevent this, first run a E-240 tape and make sure excessive tape wrinkle does not occur at each tape guide.

1. If tape wrinkle is observed at the S, T guide rollers, turn the S, T guide rollers until wrinkle disappears.
2. If tape wrinkle is observed at the No. 8 guide, perform the tilt adjustment of the ACE head.

Table 2-7-1

PARTS REPLACEMENT	ADJUSTMENT PROCEDURE
<ul style="list-style-type: none"> <li>• Head assembly (Cylinder)</li> <li>• S, T sliders assembly</li> <li>• ACE head assembly</li> <li>• Pinch lever assembly</li> <li>• No. 9 guide lever</li> </ul>	From item (a)
<ul style="list-style-type: none"> <li>• Tension lever</li> <li>• FE head</li> </ul>	From item (c)
<ul style="list-style-type: none"> <li>• Clutch gear assembly</li> <li>• S, T reel tables</li> </ul>	From item (d)

#### <Adjustment procedures>

##### 1) ACE head assembly rough adjustment

###### a. Audio head height adjustment

1. Play back the tape recorded in the SP mode. Observe the core portion of the ACE head.
2. Turn the ACE height adjusting screw so that upper tape edge matches to the upper edge of the audio head core. (Refer to Fig. 2-7-5.)

###### b. ACE head tilt adjustment

1. Play back the E-240 tape recorded in the SP mode and observe running condition of the tape at the lower flange of No.8 guide.
2. Turn the ACE tilt adjusting screw until tape wrinkle is caused at the lower flange of No. 8 guide as shown in Fig. 2-7-6 [A].
3. Turn the ACE tilt adjusting screw counter-clockwise until the tape travels along the lower flange as shown in Fig. 2-7-6 [B].

##### c. Audio head azimuth adjustment

1. Play back the 7 kHz audio signal on the alignment tape in the SP mode.
2. Connect a milli-voltmeter or oscilloscope to the audio line output terminal.
3. Turn the ACE azimuth adjusting screw to obtain maximum audio output.

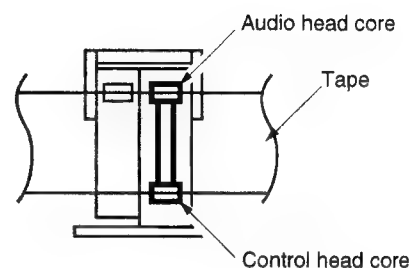


Fig. 2-7-5

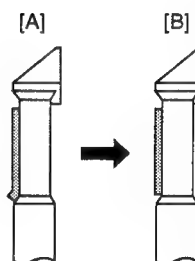


Fig. 2-7-6 No. 8 guide rough adjustment check

##### d. ACE head position adjustment

1. Play back the 3 MHz video envelope signal in the alignment tape in the SP mode. Loosen the ACE head position securing screw.
2. Insert a slot-type screwdriver into the ACE head position adjusting slit on the ACE main base and adjust the ACE main base so that the video envelope reaches a peak level at the tracking center position.

##### 2) Playback phase adjustment

Perform playback phase adjustment according to the methods stated in the Electrical Adjustment (servo system).

### 3) Linearity adjustment

1. Play back the LP mode 3 MHz white video signal on the alignment tape.

#### Note:

For models SP mode only, use the 3 MHz (A ch) video signal in the SP mode and other adjustments are same.

2. Trigger the scope with the switching pulse to issue the envelope signal output.
3. Make sure the video envelope waveform (in its maximum output) meets the specification shown in Fig. 2-7-7. Again make sure the same by playing back the SP mode 3 MHz video signal on the alignment tape. If not satisfied, adjust as follows:

#### Note:

- a : maximum output of the video RF envelope
- b : minimum output of the video RF envelope at the entrance side
- c : minimum output of the video RF envelope at the center point of cylinder
- d : minimum output of the video RF envelope at the exit side of cylinder

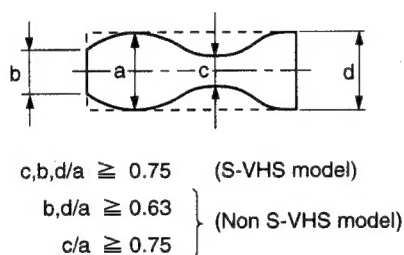


Fig. 2-7-7

4. If the A section in Fig. 2-7-8 does not meet the specifications, adjust the S guide roller in up or down direction.
5. If the B section in Fig. 2-7-8 does not meet the specifications, adjust T guide roller in up or down direction.

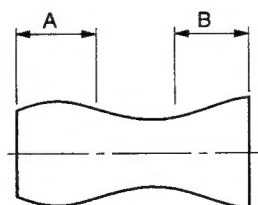


Fig. 2-7-8 Adjusting section

6. After completion of the adjustment(s), push the tracking up/down button and make sure video envelope variations are almost flat.

Next, playback the 3 MHz (A ch) SP mode video signal on the alignment tape and make sure the video RF envelope variations are also flat when tracking up/down buttons is pushed.

7. If the envelope varies like NG figures as shown in Fig. 2-7-9, perform the adjustment again since it is abnormal.

Smooth secondary curves are allowable level.

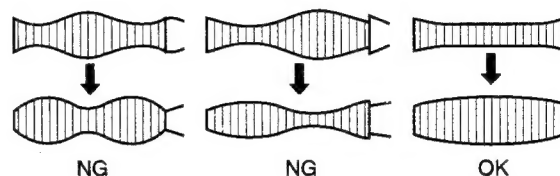


Fig. 2-7-9 Abnormal waveform variation

### 4) ACE head assembly fine adjustment

#### a. Audio head height fine adjustment

1. Play back the stereophonic alternative recording 300 to 500 Hz audio signal on the alignment tape.
2. Adjust the audio height adjusting screw so that the signal envelope is obtained almost flat.

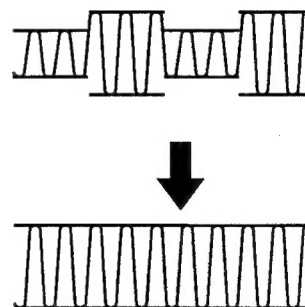


Fig. 2-7-10

#### Note:

If there is no alignment tape with audio height adjustment of the stereophonic alternative recording, do not perform this item a. Audio head height fine adjustment, and perform the process of the note in item e. Audio head height re-check described later.

#### **b. ACE tilt adjustment**

1. Observe the lower flange of No. 8 guide. If any wrinkle is observed, turn the ACE tilt adjusting screw counterclockwise until the wrinkle disappears.
2. If a gap is observed between the lower flange of No. 8 guide and the lower edge of tape, turn the ACE tilt adjusting screw clockwise until the tape travels along

#### **Note:**

This adjustment is performed easily in SP mode playback, double speed playback mode or CUE mode.

#### **c. Audio head height check**

Play back the audio signal as described in the step 1), and check if the audio envelope is flat. If not, repeat the adjustment described in step 1) again.

#### **d. Audio azimuth adjustment**

1. Play back the 400 Hz in SP mode, 7 kHz audio signal on the alignment tape.
2. Turn the ACE azimuth adjusting screw until the maximum audio output is obtained.

#### **e. Audio head height re-check**

1. Play back the audio signal as described in the step 1), and check if the audio envelope is flat. If not, repeat the adjustment described in step 1) again.

#### **Note:**

If there is no alignment tape with the stereophonic alternative recording signal, perform the audio height alignment using the current alignment tape at this adjustment step.

1. Playback the 400 Hz audio signal (SP mode) on the alignment tape.
2. Turn each three alignment screw of the ACE head to the same direction in 45 degrees steps evenly so that the audio output level becomes maximum.
3. Perform the confirmation and adjustment for the tilt and the azimuth again.

#### **f. ACE head position adjustment**

1. Play back the LP mode 3 MHz video signal on the alignment tape.
2. Push the tracking up/down buttons simultaneously and reset the tracking at its center position.
3. Trigger the oscilloscope with the video switching pulse and observe the video envelope waveform.

4. Slide the ACE main base until the maximum envelope output is obtained as described in ACE head position rough adjustment.

5. Play back the 3 MHz video signal in SP mode on the alignment tape.

6. Make sure the envelope output is maximum when the tracking control is placed at its center position.

If no envelope output is obtained with the tracking control set to the center position, again adjust it for maximum envelope output in SP and LP modes.

When envelope output is maximum in the LP mode at the tracking center, difference between the tracking position of maximum envelope in the SP mode and the tracking center is within 3ms.

7. Tighten the ACE head position fixing screw and secure the ACE main base.

#### **g. After completion of ACE head fine adjustment**

Apply screw lock to two screws (tilt, azimuth adjusting screws) in front of the ACE head.

#### **5) No. 9 guide lever check**

1. Set the VTR to Cue mode with E-240 tape (at beginning portion) loaded. Switch the Cue mode to the review mode when the tape has been rewound into the T reel table to some extent.
2. Check tape wrinkle at the upper and lower flange of No. 8 guide. Check the tape does not come off from the flange while running. If the tape comes off from the flange, replace the pinch lever, capstan motor or No. 9 guide lever since the part(s) is (are) defective.

#### **Note:**

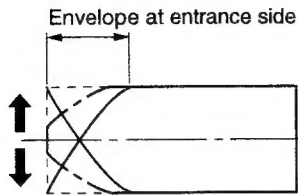
Modify the lid of the cassette for the alignment tape E-240 previously so that the alignment is performed easily.

#### **6) Check for transitional operation of envelope**

1. Play back the LP mode white video signal on the alignment tape, and set in Review mode, and then observe the video envelope with the oscilloscope.
2. Switch the Review mode to the Play mode. When switched to the Play mode, make sure the entrance side envelope comes to an approximate steady state within 3s as shown in Fig. 2-7-11.

If it does not rise within 3s, take the following steps starting 4.

3. Switch the cassette slot-in mode to the Play mode. As in item 2., if it does not rise within 3s, adjust as follows.



**Fig. 2-7-11 Video envelope rising when operation mode is switched from review to play mode**

4. Adjust the S guide roller and perform the linearity adjustment again.
5. Check above items 2. and 3. to see that the video envelope rises within 3s. If not, S slider assembly or the tension lever is damaged. Replace either (or both) of them.

**Note:**

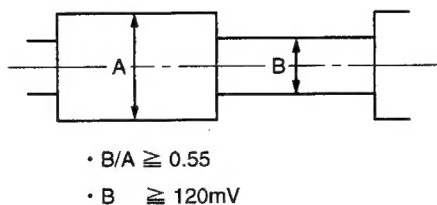
If the rising characteristic is poor in Review mode, screen noise may occur in synchronous editing recording. Perform the adjustment carefully.

**7) Envelope check**

1. Make recordings and playback the tapes E-180 and E-240 in SP and LP modes and make sure the playback output envelope meets the specifications shown in Fig. 2-7-7.
2. In recording/playback the tape with a E-180, the video envelope should meet the specification as shown in Fig. 2-7-12.

**Note:**

Check for both modes, SP and LP. Also check for AFM envelope when using a Hi-Fi model.



**Fig. 2-7-12 Envelope output and output difference**

3. If the performance does not meet both specifications above 1. and 2. above, replace the head assembly (cylinder) assembly.
4. Set the VTR to Rec mode (LP) with the E-180 tape loaded (at the beginning part) and check operation of the synchronous editing recording.
5. If picture noises are observed at the starting position of the editing, check for transitional operation (f).

**8) Tape damage check**

1. Playback the E-240 tape in the Play mode, CUE mode, Review mode and the frame advance mode, and check each guide for wrinkle.
2. If excessive tape wrinkle is observed at the mode shown below, perform the associated adjustments in each mode. Also the parts described in ( ) may need to replace.

a. Playback mode

- Tape damage at the S, T-guide rollers section
  - (c) Linearity adjustment (Slider assembly)
- Tape damage at No. 8 guide flange
  - (a) ACE head assembly rough adjustment (Pinch assembly)
- Tape damage at lower flange of No. 3 guide
  - (f) Check for transitional operations from Review to Play, and Slot-In to Play (Tension lever)

b. Review mode

- Tape damage at No. 8 guide
  - (a) ACE head assembly rough adjustment (Pinch assembly, No. 9 guide lever, capstan motor assembly)
- Tape damage at the guide rollers
  - Guide roller adjustment (or Slider assembly replacement)

c. Frame advance mode

- Tape wrinkle at No. 8 guide
  - (c) Linearity adjustment (Pinch assembly, capstan motor assembly)

**9) Maximum AFM envelope output point check (Hi-Fi model)**

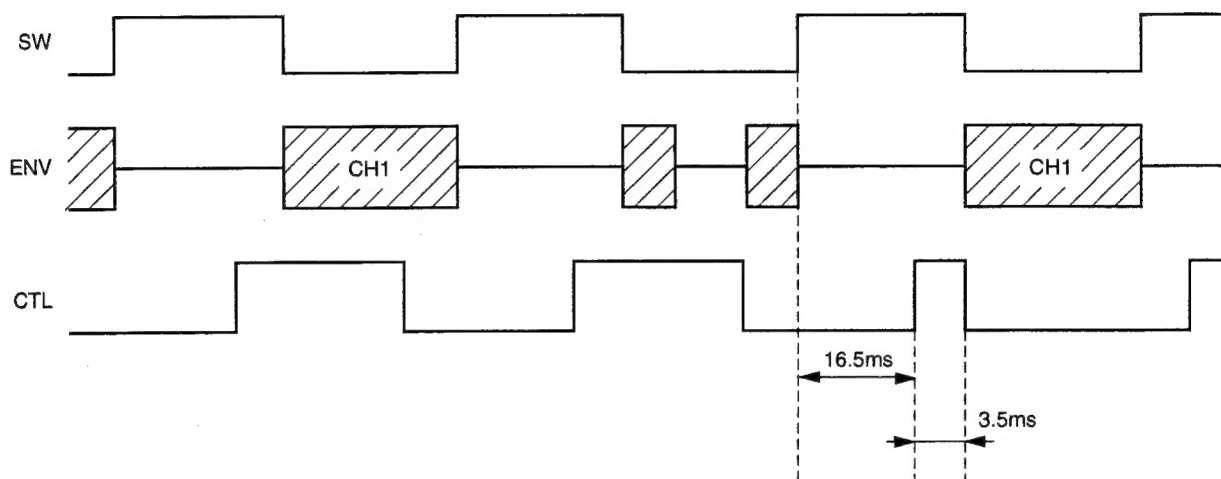
1. Playback the SP mode 3 MHz video signal and the 400 Hz AFM signal on the alignment tape.
2. Trigger the oscilloscope with the video switching pulse, adjust the tracking control and check the control pulse phase at the maximum video envelope (A ch) output point.

3. Make sure the control pulse phase difference among each maximum point of AFM envelope, A ch and B ch is within  $\pm 3$  ms with the above point used as the basic reference.

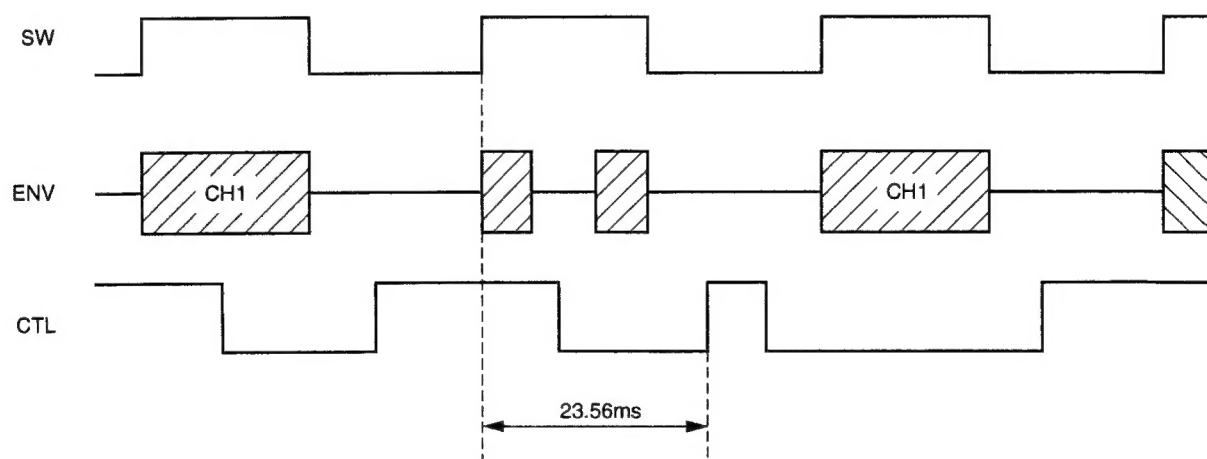
**Note:**

If the phase difference exceeds 3 ms, replace the head assembly (cylinder).

**<2 Head model (LP mode)>**



**<4 Head model (LP mode)>**



**Fig. 2-7-13 Playback video envelope**